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ABSTRACT

The efforts of geophysicists to describe geomagnetic field behaviour in the past lead to creation of different geomagnetic field models. On the other hand, the established regional palaeosecular variations of geomagnetic elements are increasingly used for dating purposes in archaeology. Both of these goals can be achieved if sufficient amounts of long archaeomagnetic data sets exist for different geographical regions. The accumulation of archaeomagnetic determinations began at the middle of the last century, parallel with the progressive development of experimental methodology and acceptance criteria. The presence of great number of old determinations requires their critical assessment. The important question about the

reliability of the associated dating intervals should be also re-assessed. All this requires the continuous refinement and extension of the accumulated databases. This paper presents the last synthesis of Bulgarian archaeomagnetic database and the local palaeosecular variation curves obtained using a statistical treatment based on Bayesian approach (RenCurve software). The rock-magnetic characteristics of the newly included, non-published results are summarized.

Key words: archaeomagnetism, database, southeastern Europe, reference curves

1. Introduction

Archaeological baked clay structures and volcanic rocks are the most valuable source of data bearing information about the past behaviour of full geomagnetic vector. On the basis of this kind of data, treated with Bayesian (Lanos, 2004; Lanos et al., 2005; Lanos et al., in preparation) or bivariate (Le Goff et al., 2002) statistics, enable secular variation curves (SVCs) to be built for a given territory. These curves should be created from sufficiently precise archaeomagnetic determinations obtained from well dated materials preferably by independent methods. In such cases, SVCs can be used in archaeology for dating purposes (Kovacheva et al., 2004; Lanos, 2004; Herve et al., 2011). The global and regional geomagnetic field modeling (Korte et al., 2009; Korte and Constable, 2011; Pavón-Carrasco et al., 2009) is the most important key for elucidating the geomagnetic field origin and fluid motions in the Earth`s interior. These complicated geophysical problems can be solved on the basis of reliable data sets of archaeomagnetic and palaeomagnetic (volcanic and sedimentary environments) determinations of geomagnetic field elements. Each database

compilation is a long, continuous process and periodical updates, revision or re-examinations are required. The accumulation of the Bulgarian data set started in 1967 and several updates have been published (Kovacheva, 1992; Kovacheva, 1997; Kovacheva et al., 2009a). In previous compilations archaeomagnetic determination from all studied collections in Sofia Palaeomagnetic laboratory (Bulgarian, Serbian, Greek, etc) were included. Now the data from non-Bulgarian archaeological sites are excluded and those obtained after 2009 (28 different features) are added. Furthermore, in the present compilation, the dating intervals for some sites were corrected according to the new ^{14}C dates that are becoming available or last archeological conceptions. The aim of this paper is to communicate the enlarged and revised after 2009 local data set and the obtained from it local reference curves for the three geomagnetic field elements during the last 8000 years.

2. General description of the extended database

The basic feature of Bulgarian archaeomagnetic data set is that it summarizes the simultaneous determination of the geomagnetic field direction (D, I) and intensity (F) – both parameters being obtained from the same material. It covers almost the entire prehistoric and historic periods. The methodology applied in the Sofia Palaeomagnetic laboratory was gradually improved and optimized over the years. Detailed information about sampling technique, experimental protocols, selection and quality criteria can be found in Kovacheva and Toshkov (1994), Kovacheva et al. (1998), Kovacheva et al. (2009a), Kostadinova-Avramova et al. (2014). The archaeomagnetic determination correspond to the feature`s mean values as “the feature is a volume of material that can be considered to have been magnetized at the same time” (Tarling,

1983). In some cases (mainly for the historic periods) “feature” coincides with the studied site, but in other (e.g. for the prehistoric periods), several “features” corresponding to different layers are related to the same archaeological site. The feature’s average values for the direction are calculated following the hierarchical approach (Lanos et al., 2005).

The used ^{14}C dates (generally series of ^{14}C dates) were taken mainly from Görsdorf and Bojadžiev (1996). Most of these were obtained by the conventional method and OxCal 4.0 software was used for their calibration. The recently received ^{14}C dates for some prehistoric archaeological sites by the AMS method were compared with those obtained by the conventional method. The both methods give consistent results (Boyadzhiev, in press). The problems concerning ^{14}C dates related to Eneolithic period are described in Boyadziev (1995) and Kostadinova-Avramova et al. (2014). When there are no ^{14}C, the archaeological assumption about the dating interval is based on stratigraphic constraints, e.g., the accumulation rate of layer and the cultural features found in it. Often, in addition to the existing ^{14}C dates, the mentioned archaeological evidences and the type of material (annual or perennial) used for ^{14}C dating were taken into account, which has led to better constraint of the dating intervals.

Please, insert the Table here

The archaeomagnetic data and all supporting information are given in a Table. For clarity the same format is kept as the Table linked to Kovacheva et al., 2009a. The differences are listed below:

- 28 newly included Bulgarian sites (given in bold).

- All the data obtained from non-Bulgarian sites (Serbian, Greek, etc) but studied in Sofia laboratory were excluded. Thus the column “Country” becomes unnecessary and it is discarded. The Serbian data were used previously for the construction of first local SVCs in Kovacheva and Toshkov, 1994 and Kovacheva et al., 1998.

- Another discarded column is “STEP” connected with the level of the thermal or alternating field cleaning. The normalized palaeointensity (PI) results corresponding to the site dipole field (PI_PIDIP) were also excluded.

- A new column for “K” was added. This column represents the grouping factor according to the Fisher (1953) statistics.

- When no data were available, the sign “*” was used in the Table.

- The results of inclination (I) of many sites represented only by brick materials were re-evaluated (e.g. Labnos 107, 108, 141) and some were discarded (e.g. these of Labnos 202, 230, 271) keeping only the intensity results.

- At the end there were 32 reference sites for which a new evaluation of the directional results (I and D) or only of the PI result had been performed (e.g. Labnos 36, 113, 156, 227, 311). The directional results for Labno 85 were discarded. This site has been studied at least 40 years ago and a doubt existed for the reliability of the results obtained on the basis of very limited number of independently oriented samples.

- Labno 97 (Kovacheva et al., 2009a) was entirely discarded because of its dubious results. Now the same Labno 97 was given to the results of one unused so far sector from the multilevel Bronze tell at Dyadovo.

- Two Labnos 10 and 294 from Kovacheva et al. (2009a), representing averaged results from successive layers in the sites Samovodene and Koprivetz, correspondingly were changed. They were both separated following the stratigraphy and the advices of archaeologists. Thus three new reference points: Labnos 354, 355 and 358 were obtained.

- For the prehistoric past the newly obtained ^{14}C dates were taken (e.g. Labnos 247, 261, 272). It should be noticed that for the sites dated on the basis of ^{14}C only, the dating intervals are now given exactly on the 95.4% probability level. This interval is often very large but is required for the subsequent mathematical applications. In some cases taking these large intervals, their midpoints are not always consistent with the stratigraphy (e.g. Labnos 306; 307; 295) Dating intervals of some prehistoric sites (layers) without ^{14}C were changed according to the last archaeological conceptions related to the stratigraphic constraints and cultural features (e.g. Labnos 50, 281, 295).

- For the prehistoric past the column showing the stratigraphic constraints is added (SC). Older/current Labno is after the «older» and before the «younger»/younger (e.g. 35/51/52) for Labno 51. The information in this column clarifies the above mention problem when considering only the midpoints.

- Besides the problems in prehistory, the dates of several Middle age sites were changed after new consultations with the archaeologists (e.g. Labnos 120, 159, 195, 314).

3. General magnetic characteristics of the unpublished sites, included after 2009

The new sites included in the last version of Bulgarian database are 28. The archaeomagnetic results from 11 of them are published (corresponding references are given in the last column of the Table – the first reference corresponds to that of Geomagia 50.v3 (in preparation) and the second one corresponds to the original (detailed) publication). The main properties of the other 17 unpublished reference points are summarized in this section.

For all studied materials different types of magnetic cleaning were performed. Viscous cleaning was done for all specimens coming from the gathered hand samples. The viscosity coefficient Sv (%) was calculated for each specimen according to the relation Sv = $\{NRM_0\text{-}NRMst)/NRM_0\}$ x100%, where NRM_0 is the initially measured remanence and NRMst is the stable component measured after the zero field storage. For the most of the studied collections acceptable (≤ 8%) values for Sv were obtained (Fig. 1a). The exceptions are three collections (Labnos 353; 356 and 366). For these, the Sv values vary over a wide range and often exceed 8% (Fig 1b). For PI determinations only specimens with Sv less than 6% were used. There are two possible explanations for the observed high Sv values: 1) the insufficient heating in the antiquity and 2) the presence of significant amount of unstable supperparamagnetic (SP) grains. The determined K_{FD} (%) for the studied materials are often more than 6% (Fig 1c). This indicates that magnetic grains with SP sizes are very common for baked clay materials

(Jordanova et al., 2001). Insufficient heating in the antiquity also is not an uncommon affecting factor - for example Labnos 368 and Labno 369 are two kilns from a recently studied archaeological site Pliska which shows high Sv and high K_{FD} values (Kostadinova-Avramova et al., in press). On the other hand the Arai plots and magnetic susceptibilities measured after each heating step (Fig 6c) indicate that both structures have been heated in the past to temperatures around 430-460^{o}C. Therefore, in this case combination of factors 1) and 2) are probably responsible for the observed high Sv values.

Please, insert Fig. 1 here

Magnetic cleaning with alternating field (AF) or temperature (Fig. 2) were applied for some selected specimens (from one to four per sample depending on the number of cut specimens). The final directional results were obtained only from the results after both AF and thermal cleanings.

Please, insert Fig. 2 here

Information about the domain state of the magnetic particles was obtained using the Lowrie and Fuller test (Lowrie and Fuller, 1971). The fact that the magnetite type minerals are dominant for the studied materials makes this test applicable. The test failed completely for all studied specimens related to Labno 366 where the highest amount of hematite was identified (Fig 3a). Therefore, for this site, no conclusion about the domain state of magnetic particles could be drawn. For the other sites the Lowrie and Fuller test determined that the magnetic grains had SD-like, BM or mixed behaviour of magnetic particles (Fig. 3b, c, d; Dunlop, 1983).

Please, insert Fig. 3 here

The identification of magnetic mineralogy was based on Tb and Tc determined from three-axis isothermal remanence thermal demagnetization – 3IRM test (Lowrie, 1990) and thermomagnetic analyses respectively. The results showed a predominant presence of magnetite type magnetic minerals (titanomagnetite and/or magnetite) for all studied materials (Fig. 4). In some cases a stable in respect to temperature maghemite was also observed (Fig 4). High coercivity minerals were rather rare for the studied collections. Hematite is supposed for Labnos 349; 365 and 366 (Fig. 4b, c, f).

Please, insert Fig. 4 here

The SIRM test (Kovacheva and Jordanova, 2001; Jordanova, et al., 2003) and thermomagnetic analyses generally showed stable mineralogy of the materials during heating (Fig 4d, e, f and Fig. 5a, b). This fact makes the material especially suitable for the obtaining good PI estimations. Strong mineralogical transformations (Fig. 5c) were detected only for very few individual cases (one or two specimens per collection for Labnos 351; 356; 357; 365 and 366) and usually the corresponding materials came from the external parts of the structures where probably the burning temperatures have been lower.

Please, insert Fig. 5 here

The PI experiment usually showed good internal consistency between the results and the number of failed experiments was generally less than 20% (Table – columns N0PI, NPI; Fig 6a,b, c). There are two exceptions - Labnos 356 and 367 (sites Malenovo and Nessebar). The material from these two sites, in spite their stable

mineralogy during heating, appears not appropriate for PI evaluation (Fig. 6d). On this basis no PI results were given for both of these sites.

Please, insert Fig. 6 here

For three of the newly studied features (Labnos 362; 363 and 370) it was not possible to determine the direction of the ancient geomagnetic field: Labno 362 and 370 - small number of collected pieces, characterized by a large dispersion; Labno 363 – the collection represented well burnt clay pieces found in a pit at a chaotically changed position.

4. Discussion of the raw data

The main difficulty in archaeomagnetic studies aiming to describe the palaeosecular variations of the geomagnetic field elements is the reliable distribution of the experimental results on the absolute scale of time (Fig. 7). This distribution depends entirely on the obtained information for dating interval of the studied structures. The last 2000 years are historically well known for the Western Europe and SVCs are obtained for France (Gallet et al., 2002) and Germany (Schnepp and Lanos, 2005). In contrast in South Europe and Asia Minor the prehistoric discoveries are very reach. The important feature of Bulgarian prehistory is the presence of multilevel settlements in which the stratigraphic chronology helps a lot the searched chronology (Kovacheva, 1995; Kostadinova-Avramova et al., 2014). Multiple revisions helped the refinement of the input data.

Please, insert Fig. 7 here

Fig. 7 shows the unchanged raw data (I, D and F), published in Kovacheva et al., 2009a (full circles), the revised and corrected data (empty squares) and the included after 2009 new points (crosses). The principle goal of the work was to improve the quality of the data revising many of them and to increase their number as far as possible. The revised points describe better the general trend for the three geomagnetic field elements. The new results are close to the previously published (crosses in comparison with full circles).

The main drawbacks of Bulgarian database are: (a) the lack of systematic corrections for any anisotropy effect on the directional and PI results and (b) the absence of any correction for cooling rate effects on the palaeointensity. These two factors should mostly affect results from bricks and pottery. In the Bulgarian data set pottery are not included. The archaeomagnetic studies in Sofia laboratory from the beginning have been always directed to determination of full geomagnetic vector from the same material. Thus pottery has been excluded as suitable material. The one exception is Labno76 – the samples were taken from the bottom of the found *in situ* pithoi. The brick collections were generally studied at the beginning of the archaeomagnetic studies in Bulgaria and are from the AD time period. The laboratory field during the PI evaluation (Coe version, 1967 of Thellier and Thellier, 1959) was directed along the z axis of the sample coordinate system. The difference 90-INC is the angular deviation of the laboratory field from the carried NRM vector. As described in Kovacheva et al., (2009b) and as well known from the literature (Odah et al., 2001), this deviation is one of the main factors for the effect of the magnetic anisotropy during the PI evaluation. For example, on a subset of 44 brick specimens the

anisotropy effect on the PI evaluations has been studied using the TRM anisotropy tensor (18) or the ARM anisotropy tensor (26). In 40 specimens the anisotropy correction was between -4% and +6% with maximum frequency being between 0% and 2%. There were four cases with a higher anisotropy effect – the highest effect being 11% in one case (Fig. 8a).

Please, insert Fig. 8 here

The other deficiency of the database is the lack of cooling rate correction. Most of archaeomagnetic data were retrieved before 2004 and are based on 24 or 20 mm cubes that were left to cool in furnaces without a fan. The cooling time varied from two to five hours depending on the temperature. As far as the multiple data come from the often thin prehistoric ovens or floor plasters which have cooled in open air, the cooling rate effect should not be so important. However, the problem remains for the bricks in the database.

Speaking about the PI determinations and the reliability of the existing data, many authors support the idea for accepting the PI determination if the standard deviation of the average site value is no more than 5 μT (Donadini et al., 2009). The chosen threshold connected with PI values about 50 μT should be quite convenient as representing ~10% of the calculated average values for the corresponding sites. At the same time if the averaged palaeointensity values are between 30-35 μT, the standard deviation of 5 μT would represent between 17 to 14% of the mean value. Such results would be considered as very reliable data, despite having poor internal consistency. In contrast, for considerably higher average PI values (~70 μT or more) the threshold of 5 μT would make many good evaluations as not acceptable. In our opinion, the threshold

given to PI should be a percentage of the calculated site's average value, saying 10%. Such a threshold has a similar drawback if very low palaeointensity values (less than 15μT) are in question. Such low intensity values are not encountered in the archaeological past and even in the entire Holocene. Following this idea we show (Fig. 8b) the distribution of PI results included in the revised data set as a function of standard deviation (STD) presented as a percentage of the mean site results. Obviously a very small part of the included PI determinations have dispersion higher than 10% of the PI site's average.

5. Bulgarian SVCs of the three geomagnetic field elements for the last 8000 years and discussion.

The main goal of each local data set is the elaboration of the local palaeosecular variations of the geomagnetic field elements in the archaeological past. The here presented extended and revised Bulgarian database is used to provide the searched secular variations over the last 8000 years. They are given in Fig. 9 (Lanos 2004, pp. 43-78; Lanos et al. in preparation).

Please, insert Fig. 9 here

The evident larger error bands immediately mark the time periods where not sufficient materials were found and studied (Fig. 7), due mainly to the lack of discovered sites. This problem is discussed in Kovacheva et al., 2009a. The most important gap is the so called Transition period after the end of Late Eneolithic - between 3850-3750 BC and the beginning of the Bronze Age about 3200-3100/2900-3000 BC (Fig. 7; Fig. 9). The archaeological problem about the impossibility to accept such a discontinuity in the prehistoric development made some authors to support the

idea for probable palaeo-climatic reason (Todorova, 1995). Middle and Late Bronze Age (around 2000 BC) is also insufficiently represented due to the small number of discovered sites. All these difficulties are just an example of how the archaeomagnetic studies depend on the existing archaeological problems. The revealed extreme palaeointensity value about 6^{th}-5^{th} century BC is in good coincidence with the similar values obtained from Greek and Western Turkey materials (De Marco et al., 2008) and also with the data from Western Europe (Herve et al., 2013). The last 500 years BC are related to the existence of the rich Thracian culture in Bulgaria with much more precise archaeological dating. Thus, the observed cloud of contradictive results (Fig. 7) which determines large error bands (Fig. 9) is somehow unacceptable. The most problematic period in the palaeointensity determination is the saw type variation in the first five centuries AD. The future filling up of the present data set is of great importance for refinement of the secular variation curves and for the Earth`s magnetic field modeling.

6. Conclusions

As a result of this study the following conclusions can be drown:

1. Each local database requires a constant maintenance, filling up and revisions.

2. Obviously the newly obtained archaeomagnetic data are close to the previously published. The later in combination with the revised points describe better the general trend of the three geomagnetic field elements.

3. The Bayesian evaluation of the local secular variation curves of the geomagnetic elements over the last 8000 years are valuable contribution to the knowledge of past

geomagnetic field behaviour in our lands. The obtained full geomagnetic vectors from the same materials are the best basis for the geomagnetic field modeling.

4. The accepted, as a global feature maximal PI value about 10^{th} century is not revealed in by our data in spite the proved important changes of geomagnetic field during the last millennia BC.

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Appendix

The abbreviations of the columns used in the Table are as follows:

LNO=LABNO – Identification laboratory number of the studied collection; **LAT** – Geographical latitude of the site location; **LONG** – Geographical longitude of the site location; **PLACE** – Name of the nearest town or village to the site location; Kap. Andreevo – Kapitan Andreevo; mon. – monastery; Gol. – Golyamo; G. Kremena – Gorna Kremena; **SITE_HORIZ** – Name of the archaeological site. Some information available as the number of the corresponding horizon, square indication and associated culture (e.g. KI – Karanovo I, KII-etc are Neolithic and Eneolithic culture related to Bulgarian relative chronology); L. – Late; E. – Early; M. – Middle; EB – Early Bronze; Eneol. – Eneolithic; LE – Late Eneolithic; ME – Middle Eneolithic; EE – Early Eneolithic; TP – Transition period; LN – Late Neolithic; c. – century; ch. – church; cer. – ceramic; St. – Saint; sq – square; Med. – Medieval; Bogor. – Bogoroditza; mat. – material; dwell. – dwelling; West. – Western; Chr. – Christian; amphith. – amphitheater; hor. – horizon; dwrd or upwrd – the horizons in multilevel prehistoric

settlements are counted downward or upward respectively; Multil. – multilevel; Trans. – transition; per. – period, lev. – level; beg. – beginning; Supp. – supposed; cult. – culture; equipm. – equipment; settl. – settlement; sect. – sector; **MAT=MATERIAL** – Type of the used material or structure sampled: BR – brick as displaced material; bBR - burnt brick in the kiln construction; BC – baked clay; BS – burnt soil; P – pottery; KL – kiln; HR – hearth or oven – thinner clay floor plaster (generally for the prehistoric sites); bST – burnt stone; BF – burnt floor; T – tile; **LAGE= LOWAGE** – Oldest limit of the dating interval in years (negative values for the time before Christ – BC); **HAGE=HIAGE** – Youngest limit of the dating interval in years (negative values for the time before Christ – BC); **DTP=DTPOINT** – The center of the dating interval – Midpoint; **SC** – Stratigraphic constraints; **DM=DEMAG** – The magnetic cleaning used for the directional data (T – thermal, AF – with alternating field, TA – thermal and alternating field); **NDIR** – Number of the results used for the final directional determination; **DEC** – The value of mean declination obtained for a studied feature given in degree; **INC** – The value of mean inclination obtained for a studied feature given in degree; **α95%=ALFA95%** - Semi angle of the confidence cone according to Fisher (1953), when both DEC and INC data are available; **K** – The precision parameter K (grouping factor) according to the Fisher statistics (1953) when both DEC and INCL are available. In the case of bricks, providing only INC, K is calculated by the relation: $K=(1/S)^2*(180/\pi)^2$ (Lanos et al., 2005); **N0PI** – Number of specimens subjected to the palaeointensity determination (PI) experiment; **NPI** – Number of the results accepted according to the Sofia Palaeomagnetic laboratory quality criteria and used for the final mean PI determination; **σ=STDPI** – The obtained standard deviation from the weighted

statistics. In the case of single results, the standard error of the best fitted line is given; **AN_cor** - When anisotropy correction for PI was studied the type of the remanence used is noted (ARM – Anhysteretic Remanent Magnetization; IRM - Isothermal Remanent Magnetization; TRM – Thermo Remanent Magnetization); **TYPE -** Classical Thellier and Thellier (1959) method was used from the beginning of archaeomagnetic studies in Bulgaria until 2004. After the Coe (1967) modification is applied. Taking into account that the acceptance criteria were modified and optimized during the years, different abbreviations are used for TYPE: THDL – the oldest results when PI was estimated according to the stability of direction and linearity of Arai plot; THkD – to the previous criteria the magnetic stability behaviour during heating was added; THpT – latest results – to the previous criteria pTRM tests were also included. When it appear twice, the results of classical Thellier` method with pTRM tests were checked up with the Coe` version. When two types are noted additional check-up experiments were performed to control those obtained by older methods. The results obtained by the two methods are averaged on the basis of internal consistency, which was proved in the most cases; **FLDNUMBER** – Samples field numbers used for the studied feature; **DATING** – The independent dating method used for each feature. When ^{14}C is given in brackets (mainly for the Eneolithic period) the obtained ^{14}C dates are not taken into account due to the contradictions with vertical stratigraphy and archaeological evidences (Boyadziev, 1995). AD – Anno Domini; archaeol. – archaeological; begin. – beginning; c. – century; strat. – stratigraphy; synchron. – synchronization; rel. – relative; **REF=REFERENCE** – The first numbers given in this column correspond to the

numbers in the Geomagia 50.v3 – in preparation - (http://geomagia.ucsd.edu). When the second number is 502 through it the original publications can be seen.

172 – Jordanova, N., Kovacheva, M., Kostadinova, M., 2004. Archaeomagnetic investigation and dating of Neolithic archaeological site (Kovatchevo) from Bulgaria. Phys. Earth Planet. Inter., 147, 2-3, 89-102.

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175 – Kovacheva, M., Hedley, I., Jordanova, N., Kostadinova, M. and Gigov, V., 2004 Archaeomagnetic dating of archaeological sites from Switzerland and Bulgaria. J. Archaeological Science, 31, 1463-1479.

197 - Kovacheva, M., 1997. Archaeomagnetic database from Bulgaria: the last 8000 years. Phys. Earth Planet. Inter., 102, 145-151.

239 – this study

369 - Herries, A.I.R., Kovacheva, M., Kostadinova, M., 2008. Mineral magnetism and archaeomagnetic dating of a medieval oven from Zlatna Livada, Bulgaria. Physics and Chemistry of the Earth 33, pp 496-510.

370 - Kostadinova, M., 2009. Magnetic properties of baked clay as an object of archaeomagnetic investigations. New results in Bulgarian archaeomagnetic database. PhD thesis, BAS, 2009.

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373 – Jordanova, N. and Kovacheva, M., 1998. Dating the fire in Kajmenska Chuka by the archaeomagnetic method. In: The Steps of James H. Gaul, M. Stefanovich, H. Todorova, H. Hauptmann (eds.), Series, 1, Sofia, BAS, 339-347.

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509 - Donadini, F., Kovacheva, M., Kostadinova-Avramova, M. Archaeomagnetic Study of Roman Lime Kilns (1 c. AD) and One Pottery Kiln (1st c. BC – 1st c. AD) at Krivina, Bulgaria, as a Contribution to Archaeomagnetic Dating. *Archaeologia Bulgarica,* XIV, 2 (2010), 23.38.

519 - Kostadinova-Avramova, M. Advantages and disadvantages of bricks as a material for archaeomagnetic studies, NAIM-BAS, Sofia. In press.

520 – Kovacheva, M., Kostadinova-Avramova, M., Jordanova, N., Boyadzhiev, Y., Gergova, D., Dermendjiev, N., Kancheva, T., Genov, D. Chronostratigraphy of the Dyadovo settlement mound on the basis of archaeomagnetic studies. Dyadovo Vol.2, BAS, Sofia, in press (in Bulgarian).

552 - Kostadinova_Avramova, Lesigyarski, D., M., Kovacheva, M. *in press*. Archaeomagnetic study of two medieval ovens discovered in the Pliska Palace, North-eastern Bulgaria. *Bulgarian e-Journal of Archaeology*, vol. 4 (2014) XX–XX.

553 – Kovacheva, M. Archaeomagnetic Investigations in Bulgaria: Field Intensity determinations. *Phys. Earth Planet. Inter*., 13, 1977, 355-359.

554 - Kovacheva, M., Jordanova, N., Kostadinova, M., Karloukovski, V., Gigov, V., Gergova, D. and Genov, D. Summary results of the archaeomagnetic studies of the Bronze Age tell Djadovo, district of town Sliven, Bulgaria. Archaeologia Bulgarica, VI, 2002, 1, 1-17.

TABLE AND FIGURE CAPTION

Table. The state of Bulgarian database related to 2014 (the detailed description of the columns is given in the Appendix). The results of sites obtained between 2009 and 2014 are given in bold. The corrected results of the presented in Kovacheva et al. (2009a) features are given in italic. All remained data are in regular font.

Fig. 1. Distribution of viscosity coefficient for representative features a) with mostly acceptable Sv(%) values, b) with Sv values often higher than 8% and c) distributions of K_{FD} (%) values for three representative newly studied features.

Fig. 2. Representative examples of a) AF demagnetization and b) thermal demagnetization of the carried remanence.

Fig. 3. Representative examples of Lowrie and Fuller test showing a) the presence of high coercivity magnetic mineral (i.e. failed experiment), b) single domain (SD), c) bimodal (BM) and d) mixed behaviour of magnetic grains.

Fig. 4. Representative examples of a), b) and c) stepwise thermal demagnetization of three components IRM (3IRM test) and d), e), f) high temperature behaviour of magnetic susceptibility – heating and cooling curves.

Fig. 5. Representative examples of SIRM test – a), b) insignificant and c) strong mineralogical changes during heating. SIRM (2T) is the isothermal remanent magnetization induced at each temperature step; SIRMleft is the remained part of the induced SIRM (2T) by the thermal demagnetization at the corresponding step; 3IRM curve is the thermal demagnetization of the module of three-axes single induced isothermal remanece (on the sister specimen), K/K20 – normalized to the initial value magnetic susceptibility measured after each temperature step.

Fig. 6. Representative examples of a), b, c) successful and d) failed PI determination experiments.

Fig. 7. The raw data of extended and revised database. Different symbols are given to the new data, revised ones and unchanged data from Kovacheva et al., 2009.

Fig. 8. a) Distribution of anisotropy correction on PI values from an extract of 44 brick (BR) samples and b) Distribution of all PI results as a function of standard deviation expressed as a percentage of the mean PI per site.

Fig. 9 Bulgarian SVCs of the three geomagnetic field elements based on Bayesian approach (Lanos et al., in preparation).

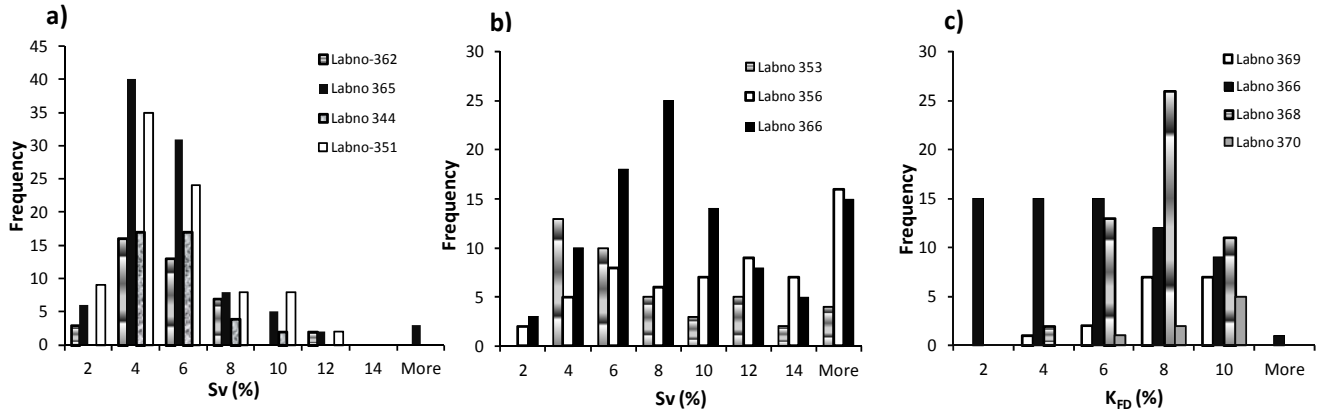

Fig. 1

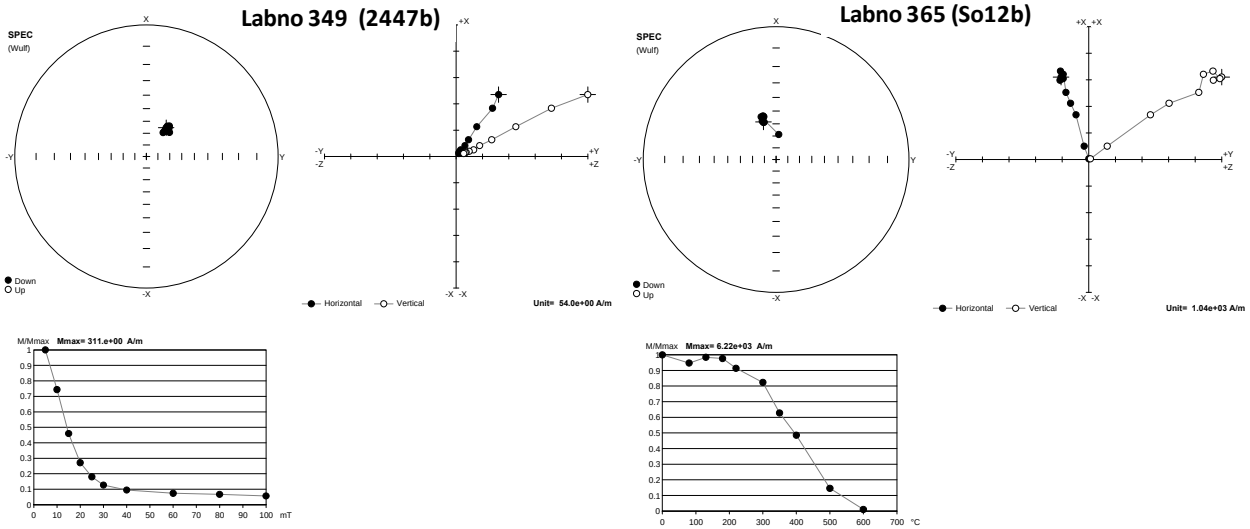

Fig. 2

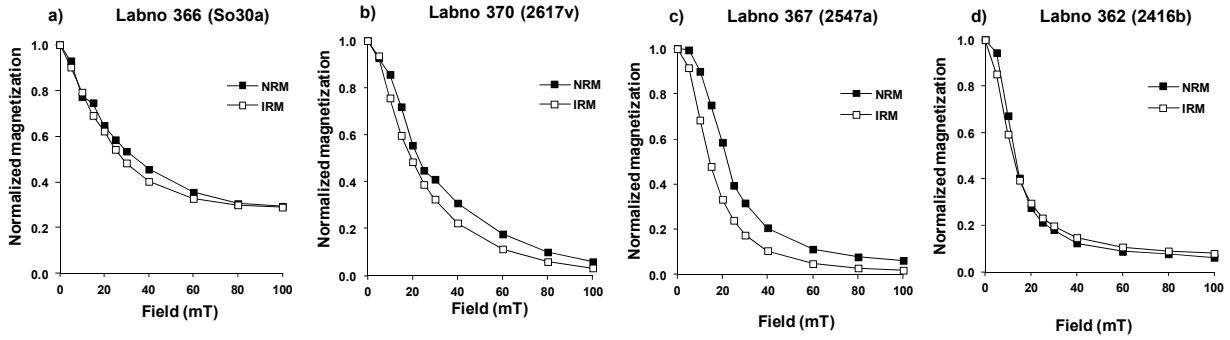

Fig. 3

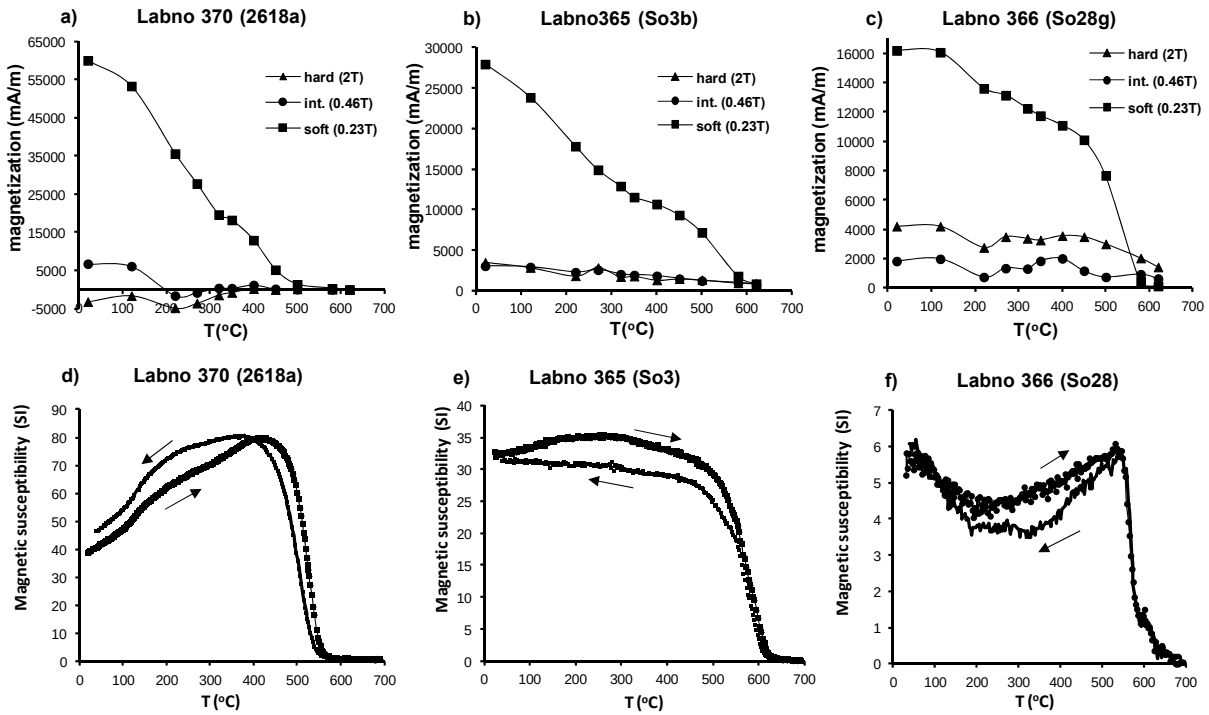
a) Labno 370 (2618a)
b) Labno365 (So3b)
c) Labno 366 (So28g)
magnetization (mA/m)
hard (2T)
int. (0.46T)
soft (0.23T)
T(°C)
d) Labno 370 (2618a)
e) Labno 365 (So3)
f) Labno 366 (So28)
Magnetic susceptibility (SI)
T (°C)

Fig. 4

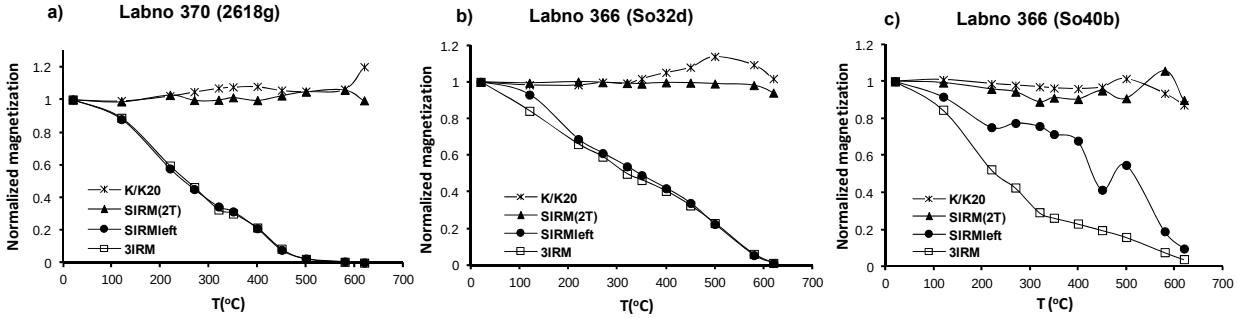
a) Labno 370 (2618g)
b) Labno 366 (So32d)
c) Labno 366 (So40b)
Normalized magnetization
K/K20
SIRM(2T)
SIRMleft
3IRM
T(°C)

Fig. 5

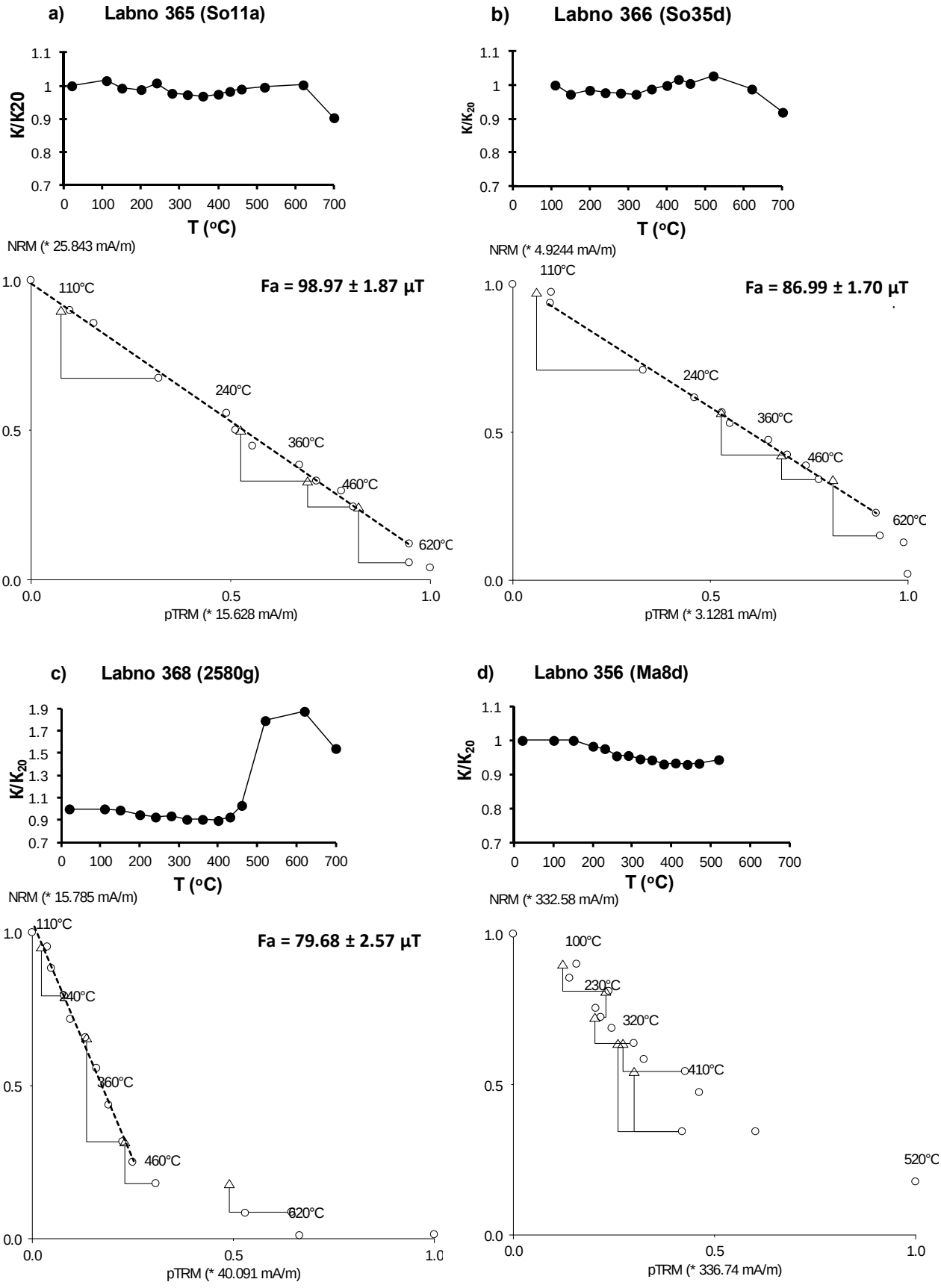
a) Labno 365 (So11a)
K/K20
T (°C)
NRM (* 25.843 mA/m)
Fa = 98.97 ± 1.87 µT
110°C
240°C
360°C
460°C
620°C
pTRM (* 15.628 mA/m)
b) Labno 366 (So35d)
K/K20
T (°C)
NRM (* 4.9244 mA/m)
Fa = 86.99 ± 1.70 µT
110°C
240°C
360°C
460°C
620°C
pTRM (* 3.1281 mA/m)
c) Labno 368 (2580g)
K/K20
T (°C)
NRM (* 15.785 mA/m)
Fa = 79.68 ± 2.57 µT
110°C
240°C
360°C
460°C
620°C
pTRM (* 40.091 mA/m)
d) Labno 356 (Ma8d)
K/K20
T (°C)
NRM (* 332.58 mA/m)
100°C
230°C
320°C
410°C
520°C
pTRM (* 336.74 mA/m)

Fig. 6

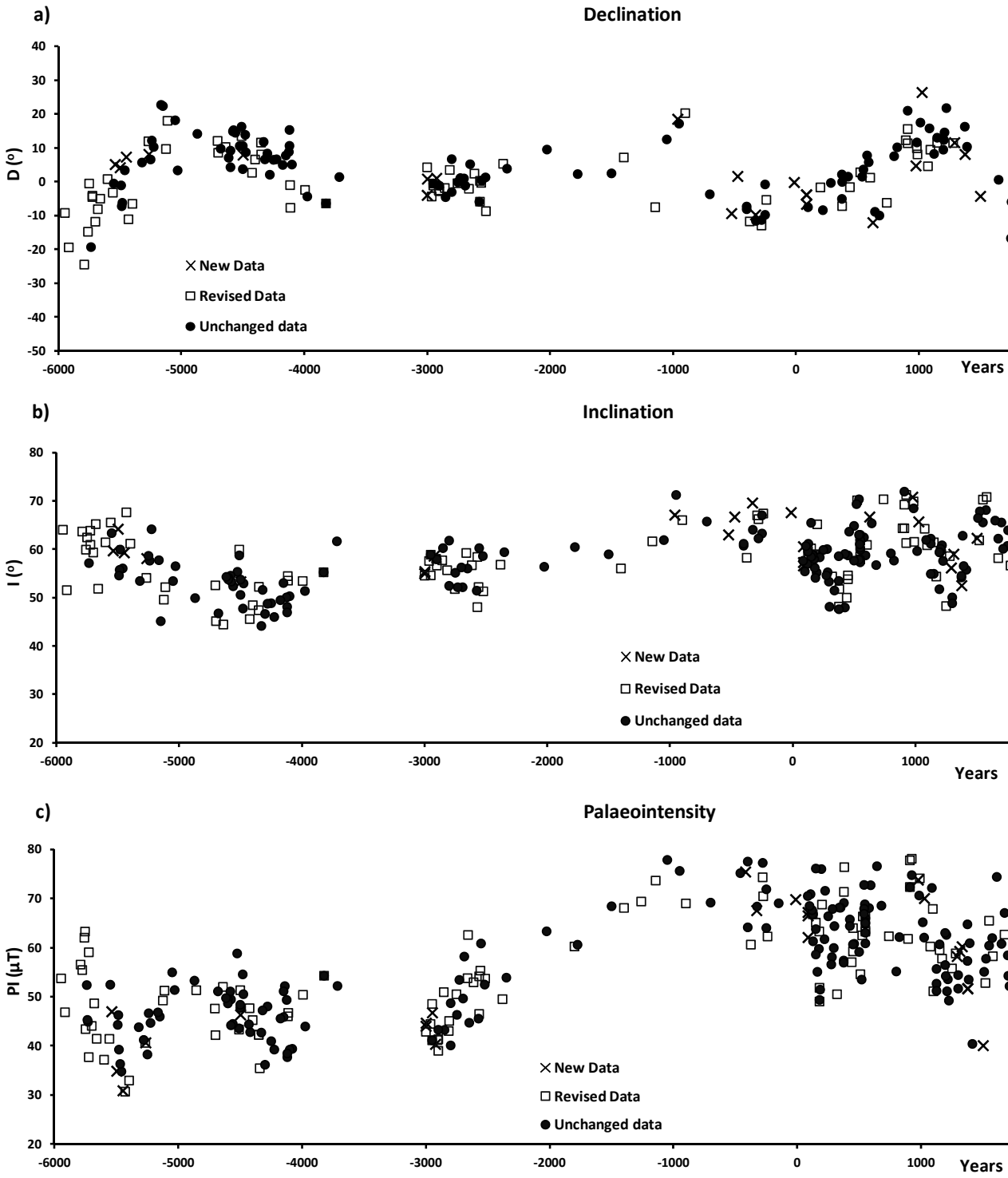
a)
Declination
D (°)
Years
New Data
Revised Data
Unchanged data
b)
Inclination
I (°)
Years
New Data
Revised Data
Unchanged data
c)
Palaeointensity
PI (μT)
Years
New Data
Revised Data
Unchanged data

Fig. 7

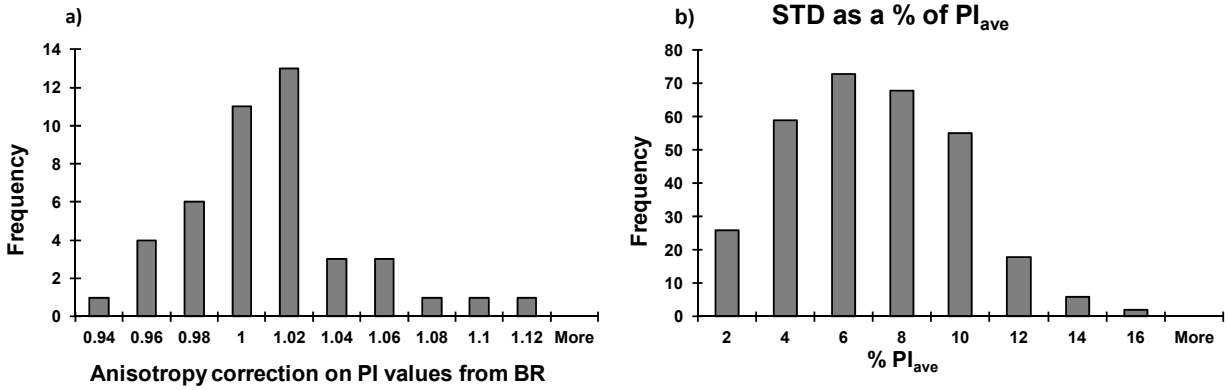
a)
Frequency
14
12
10
8
6
4
2
0
0.94
0.96
0.98
1
1.02
1.04
1.06
1.08
1.1
1.12
More
Anisotropy correction on PI values from BR
b)
STD as a % of PIave
Frequency
80
70
60
50
40
30
20
10
0
2
4
6
8
10
12
14
16
More
% PIave

Fig. 8

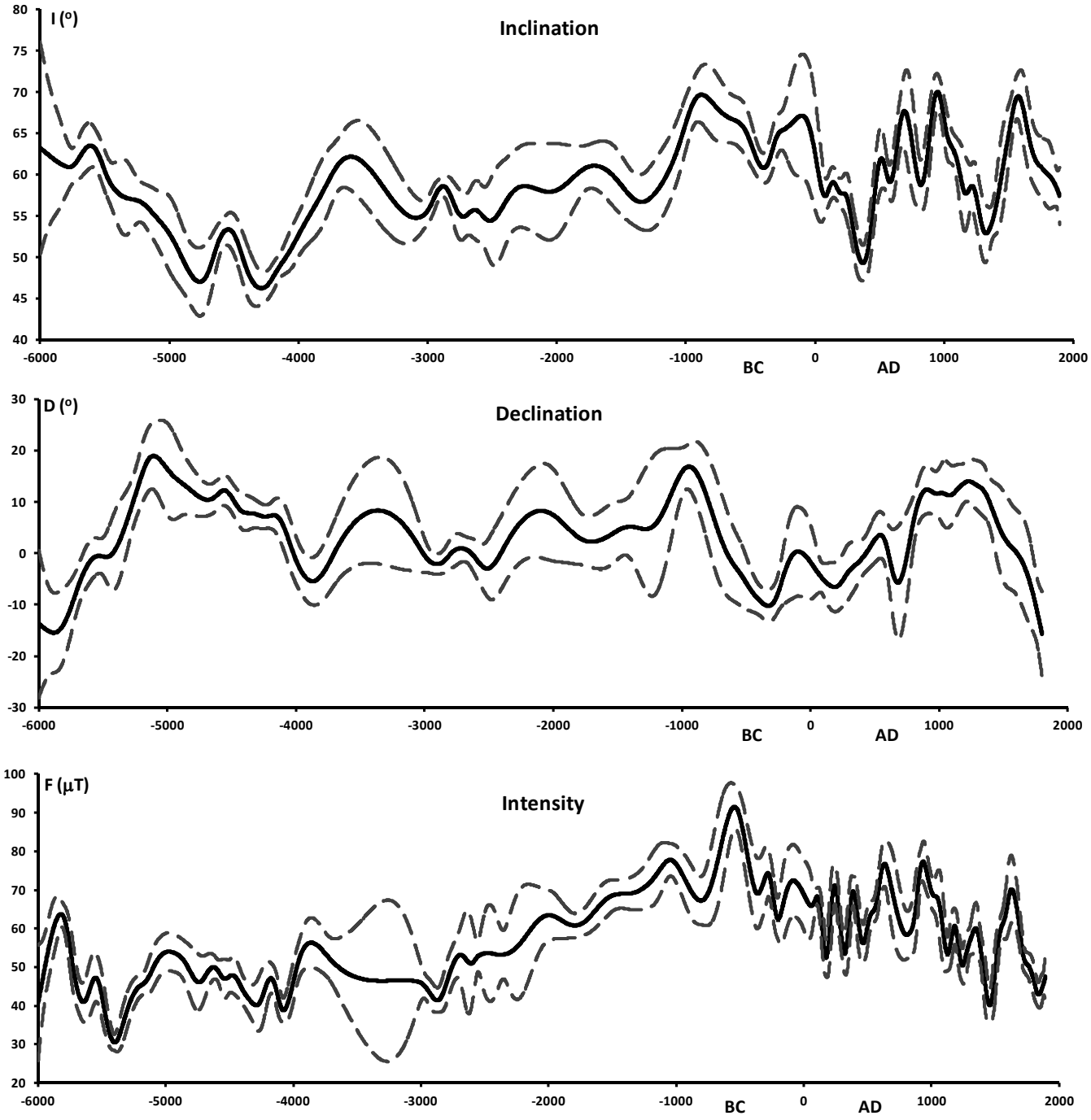
I (°)
Inclination
80
75
70
65
60
55
50
45
40
-6000
-5000
-4000
-3000
-2000
-1000
BC
0
AD
1000
2000
D (°)
Declination
30
20
10
0
-10
-20
-30
-6000
-5000
-4000
-3000
-2000
-1000
BC
0
AD
1000
2000
F (μT)
Intensity
100
90
80
70
60
50
40
30
20
-6000
-5000
-4000
-3000
-2000
-1000
BC
0
AD
1000
2000

Fig. 9

LNO	LAT	LONG	PLACE	SITE_HORIZ	MAT	LAGE	HAGE	DTP	SC	DM	NDIR	DEC	INC	α_{95}	K	N0PI	NPI	PI	σ	AN_cor	TYPE	FLDNUMBER	DATING	REF
239	42.20	27.80	Tzarevo	The old church	BR	1894	1894	1894		T	5	*	53.00	6.71	73	4	4	43.76	1.44	*	THDL	146-150	documents	197
238	43.10	25.70	Veliko_Tarnovo	Preobrajenski monaster	BR	1893	1893	1893		T	5	*	58.70	3.35	293	5	5	47.29	3.26	*	THDL	589-595	documents	197
352	**43.10**	**25.70**	**Veliko_Tarnovo**	**Bricks with incription of the date**	**BR**	**1888**	**1888**	**1888**		**TA**	**2**	*****	**57.20**	**4.03**	**202**	**2**	**2**	**44.54**	**0.06**	**ARM**	**THpT**	**2365-2366**	**inscription**	**239, 519**
237	43.10	25.70	Veliko_Tarnovo	Fireplace in a Turkish dwelling	KL	1886	1886	1886		*	*	*	*	*	*	4	4	51.61	1.61	*	THDL	B170-B174	historical	197
236	43.20	27.90	Varna	Turkish building	BR	1874	1874	1874		T	3	*	59.70	1.56	1350	3	3	41.00	3.94	*	THDL	306-308	documents	197
235	43.10	25.70	Veliko_Tarnovo	Church Saint "Konstantin and Elena"	BR	1873	1873	1873		T	12	*	57.87	5.04	129	5	5	47.29	1.16	*	THDL	576-588	inscription	197
234	43.10	25.70	Veliko_Tarnovo	Samovodski market	BR	1868	1868	1868		*	*	*	*	*	*	5	5	45.25	4.39	*	THDL	1111-1123	inscription	502
322	*43.10*	*25.70*	*Veliko_Tarnovo*	*Turkish mosque turned to Christian ch.*	*BR*	*1800*	*1878*	*1839*		*	*	*	*	*	*	*20*	*17*	*42.13*	*2.45*	*ARM*	*THpT*	*2329-2364*	*supposed archaeol.date*	*239,519*
226	41.50	23.40	Melnik	Fireplace - Kordupulova house	BR	1800	1850	1825		*	*	*	*	*	*	3	3	42.17	0.28	*	THDL	1715-1725	historical	197
229	41.47	25.65	Krumovgrad	Mosque	BR	1809	1809	1809		T	3	*	61.03	3.52	265	4	3	46.50	0.38	*	THDL	1291-1294	inscription	197
230	*41.50*	*25.30*	*Djebel*	*Mosque*	*BR*	*1780*	*1780*	*1780*		*	*	*	*	*	*	*7*	*4*	*45.54*	*2.12*	*	*THDL*	*1284-1290*	*documents*	*239,502*
227	*43.00*	*25.50*	*Trojan*	*Furnace for daily ceramics*	*KL*	*1750*	*1800*	*1775*		*T*	*3*	*343.60*	*56.60*	*5.40*	*525*	*7*	*7*	*52.15*	*3.09*	*	*THDL/THpT*	*1340-1346*	*archaeological*	*239,502*
228	43.10	25.70	Veliko_Tarnovo	Tzarevetz-Turkish kiln for daily cer.	KL	1750	1760	1755		T	4	354.06	63.89	3.37	745	6	5	50.07	3.09	*	THDL/THpT	1300-1304	archaeological	502
220	43.30	24.60	Pleven district	Bivolare-Medieval kiln	KL	1700	1800	1750		T	9	343.29	60.65	3.80	182	3	3	52.24	1.91	*	THDL	1739-1748	archaeological	502
224	43.85	26.00	Russe	Bey's house	BR	1700	1730	1715		T	12	*	60.06	5.20	122	4	4	52.14	1.09	*	THDL	1666-1679	historical	197
225	42.70	23.30	Sofia	Tombs No3 & No9 - "St.Spass"	BR	1690	1720	1705		*	*	*	*	*	*	9	6	54.24	4.73	*	THDL	1381-1395	archaeological	197
231	42.00	24.30	Peshtera	Clock tower	BR	1701	1701	1701		T	7	*	65.50	5.03	130	6	6	58.41	2.47	*	THDL/THpT	B251-B257	historical	197
223	42.70	23.30	Sofia	Serdica-East door-Turkish dwelling	BR	1650	1700	1675		T	10	*	62.16	4.67	151	5	5	67.04	5.92	*	THDL	682-694	historical	197
187	*41.80*	*24.80*	*Assenovgrad*	*Bachkowski monastir-Dining room*	*BR*	*1650*	*1700*	*1675*		*T*	*4*	*	*58.12*	*4.98*	*133*	*4*	*4*	*62.64*	*4.09*	*	*THDL*	*621-627*	*archaeological*	*239,502*
258	42.70	23.30	Sofia	Serdica-oven No1 - the Isljam period	BC	1550	1750	1650		TA	5	0.60	65.90	2.10	1285	5	2	60.75	5.45	ARM	THpT	2272-2278	archaeol.-ceramic's feature	175
222	43.10	25.70	Veliko_Tarnovo	Church "Saint Georges"	BR	1612	1612	1612		*	*	*	*	*	*	5	5	74.37	3.92	*	THDL	1322-1330	documents	502
217	*42.27*	*23.10*	*Dupnitza*	*Mosque*	*BR*	*1540*	*1620*	*1580*		*T*	*7*	*	*70.78*	*1.81*	*1003*	*5*	*5*	*58.23*	*4.93*	*	*THDL*	*1361-1368*	*archaeological*	*239,502*
215	42.70	23.30	Sofia	The old church - site "St.Spass"	BR	1550	1600	1575		T	5	*	68.08	4.81	142	6	5	61.93	3.62	*	THkD	1396-1400	archaeological	502
214	*43.50*	*26.50*	*Razgrad*	*Teke Demir Baba*	*BR*	*1500*	*1600*	*1550*		*T*	*10*	*	*69.46*	*4.47*	*164*	*4*	*4*	*60.78*	*1.84*	*	*THDL*	*R'1-R'15*	*historical (chronicle)*	*239,502*
213	*42.45*	*26.00*	*Grafitovo*	*Kademli Baba Teke*	*BR*	*1540*	*1560*	*1550*		*T*	*7*	*	*70.24*	*4.67*	*151*	*6*	*6*	*65.45*	*4.60*	*	*THDL/THpT*	*1246-1259*	*archaeological*	*239,502*
219	43.20	27.45	Provadia	Choban mosque	BR	1500	1600	1550		T	9	*	65.51	2.95	378	7	6	60.38	2.63	*	THDL	280-292	archaeological	502
212	41.93	25.90	Harmanli	Kervan saraj	BR	1500	1550	1525		T	17	*	67.80	4.12	194	5	5	57.72	1.70	*	THDL	1267-1283	historical	197
216	*43.43*	*28.30*	*Kavarna*	*Turkish baths*	*BR*	*1510*	*1530*	*1520*		*T*	*7*	*	*61.81*	*5.11*	*126*	*5*	*4*	*52.78*	*4.53*	*	*THDL*	*349-357*	*archaeological*	*239,502*
208	42.70	23.30	Sofia	Church "Saint Petka Samardjijska"	BR	1490	1530	1510		TA	22	*	66.43	5.98	92	10	10	55.05	3.45	*	THkD	2003-2037	archaeological	502
364	**41.80**	**23.50**	**Bansko**	**Sanctuary in Medieval site**	**BC**	**1450**	**1550**	**1500**		**TA**	**10**	**355.80**	**62.30**	**6.20**	**61**	**6**	**4**	**40.09**	**2.74**	*****	**THpT**	**2102-2114**	**archaeological**	**239**
209	43.10	25.70	Veliko_Tarnovo	Church "Saint Peter and Pavel"	BR	1330	1500	1415		T	6	*	55.72	2.06	774	4	4	40.38	1.25	*	THDL	569-574	documents	197
203	43.10	25.70	Veliko_Tarnovo	Tzarevetz - the fire - Turk's invasion	BC	1393	1393	1393		T	8	10.36	56.49	3.70	217	11	9	60.88	5.76	*	THDL	141-3//168-173//1460-7//1582	historical documents	502
201	41.93	25.50	Haskovo	The old mosque	BR	1385	1385	1385		T	5	*	62.76	2.28	632	6	4	53.48	1.46	*	THpT	57-61	documents	502
370	**42.23**	**27.78**	**Kiten**	**Urdoviza Fortress-Med.ceramic furnace**	**KL**	**1347**	**1403**	**1375**		**TA**	*****	*****	*****	*****	*****	**8**	**7**	**51.73**	**1.52**	*****	**THpT**	**2614-2620**	**coins**	**239**
361	**42.23**	**27.78**	**Kiten**	**Urdoviza Fortress-Med.ceramic furnace**	**BC**	**1347**	**1403**	**1375**		**TA**	**10**	**8.20**	**52.50**	**1.70**	**789**	**17**	**15**	**51.64**	**1.70**	*****	**THpT**	**2525-2546**	**coins**	**239**
207	43.10	25.70	Veliko_Tarnovo	Church "40 Saint Martyrs"	BR	1350	1400	1375		T	9	*	54.13	4.23	184	5	5	57.27	2.02	*	THDL	1331-1339	documents	197
198	42.30	26.00	Dyadovo	Medieval layer on top of Bronze Age tell	BC	1350	1400	1375		TA	10	16.30	54.47	1.80	715	4	4	64.72	3.71	*	THDL	1750-1762	archaeological	197
363	**41.50**	**25.30**	**Momchilgrad**	**Sedlare-Pit in Medieval necropolis**	**BC**	**1280**	**1380**	**1330**		*****	*****	*****	*****	*****	*****	**8**	**7**	**60.22**	**3.96**	*****	**THpT**	**1943-1958**	**archaeological**	**239**
349	**44.10**	**27.28**	**Silistra**	**Drustur-Medieval furnace No4**	**BC**	**1270**	**1350**	**1310**		**TA**	**2**	*****	**59.00**	**1.56**	**1350**	**6**	**5**	**59.28**	**4.10**	*****	**THpT**	**2444-2448**	**archaeological**	**239**
205	43.20	27.90	Varna	Medieval church	BR	1280	1320	1300		T	5	*	50.00	5.15	124	4	3	54.39	1.56	*	THDL	341-348	archaeological	197

185	41.50	23.40	Melnik	Boyar house	BR	1280	1320	1300	T	9	*	48.79	4.68	150	8	7	51.64	4.97	*	THDL	1680-1697	archaeological	502
344	**44.10**	**27.28**	**Silistra**	**Drustur-Medieval furnace No3**	**BC**	**1260**	**1320**	**1290**	**TA**	**10**	**11.67**	**56.16**	**3.05**	**252**	**11**	**9**	**58.24**	**2.81**	*****	**THpT**	**2422-2437**	**coin;stratigraphy**	**239**
159	*44.10*	*27.28*	*Silistra*	*Drustur-Medieval furnace*	*BC*	*1250*	*1310*	*1280*	*TA*	*8*	*11.47*	*58.54*	*4.96*	*126*	*17*	*15*	*58.80*	*2.50*	*ARM*	*THpT*	*2380-2403*	*archaeological*	*239,502*
204	*43.80*	*25.60*	*Cherven*	*Medieval fortress*	*BR*	*1200*	*1300*	*1250*	*T*	*10*	*	*48.21*	*5.32*	*116*	*5*	*5*	*55.74*	*4.04*	*	*THDL*	*1049-1066*	*archaeological*	*239,502*
319	43.10	25.70	Veliko_Tarnovo	Medieval kiln for metal production	BC	1200	1250	1225	TA	6	21.79	57.55	3.73	324	8	7	49.20	1.12	*	THpT	2318-2328	archaeological	370
199	43.10	25.70	Veliko_Tarnovo	King Ivan Assen tomb-"St.40 Martyrs" ch.	BR	1203	1230	1217	T	9	*	60.79	3.48	271	4	4	53.53	4.75	*	THDL	558-568	documents, coins	502
312	41.80	26.10	Lubimetz	Orta Burun-sq.E9-10+kiln No1+oven-C7	KL	1180	1240	1210	TA	23	14.60	59.71	2.00	224	15	13	51.10	4.10	TRM;IRM	THpT/THpT	2173-2206	coins-end12-begin.13c.AD	502
196	42.20	24.20	Kovachevo	Destructions after an ancient fire	BC	1180	1230	1205	T	4	12.39	60.07	6.32	212	11	6	62.57	2.66	*	THDL	1203-1228	coins	502
248	43.10	25.70	Veliko_Tarnovo	Med. kilns:metal&domestic production	BC	1150	1250	1200	TA	6	9.50	59.30	3.30	546	7	6	54.19	3.37	*	THpT	2438-2443	archaeological (ceramic)	370
194	41.50	23.40	Melnik	Despot Slav fortress - Saint Nikola place	BR	1180	1210	1195	T	24	*	51.70	5.40	113	7	4	62.97	4.87	*	THDL	1560-1573//1698-1699	archaeological	502
144	42.00	24.80	Assenovgrad	Medieval church "Saint Jana"	BR	1180	1210	1195	T	4	*	59.35	5.12	*125*	6	2	56.43	3.41	*	THpT	628-631	archaeological	502
195	*42.20*	*24.30*	*Pazardjik*	*Tzepina fortress-water reservoirs*	*BR*	*1120*	*1220*	*1170*	*T*	*22*	*	*54.32*	*5.17*	*123*	*7*	*6*	*57.75*	*5.33*	*	*THDL*	*971-998//50//51*	*archaeological*	*239,502*
188	42.50	26.00	Assenovets	Medieval settlement-Markova water mill	KL	1100	1200	1150	T	7	13.04	54.89	3.90	238	5	5	60.64	3.90	*	THDL	1587-1595	archaeological	197
311	*41.80*	*26.10*	*Ljubimetz*	*Orta burun-kiln No2*	*KL*	*1100*	*1200*	*1150*	*TA*	*6*	*11.50*	*61.40*	*6.60*	*104*	*5*	*3*	*59.49*	*2.81*	*TRM*	*THpT*	*2157-2172*	*coins*	*239,502*
192	42.00	24.80	Assenovgrad	The fortress-church "St.Bogor.Petrichka"	BR	1100	1150	1125	T	5	*	62.16	2.01	813	3	3	52.64	5.63	*	THDL	614-619	historical	197
191	43.12	25.70	Veliko_Tarnovo	Church "Saint Dimitar"	BR	1100	1150	1125	T	16	*	54.86	5.24	120	7	7	55.64	3.06	*	THDL	1305-1320	historical	197
313	42.10	26.10	Iskritza	Kiln used to the middle of 12 century	KL	1100	1150	1125	T	6	8.25	61.11	6.66	104	5	5	51.19	2.20	TRM;IRM	THpT	2208-2216	archaeological	197
271	*42.10*	*24.20*	*Patalenitza*	*The church*	*BR*	*1050*	*1150*	*1100*	*	*	*	*	*	*	*6*	*6*	*51.10*	*4.70*	*	*THDL*	*1726-1738*	*archaeological*	*239,502*
197	*42.60*	*23.00*	*Pernik*	*Krakra fortress-burnt soil of ancient fire*	*BC*	*1080*	*1110*	*1095*	*T*	*7*	*9.50*	*60.80*	*3.70*	*264*	*11*	*5*	*67.86*	*2.92*	*	*THDL/THpT*	*1347-1360*	*archaeological*	*239,502*
210	42.10	25.43	Chirpan	Zlatna livada-Medieval domestic oven	BC	1025	1150	1088	TA	10	15.80	61.90	1.10	1832	9	5	72.13	3.49	*	THpT	2367-2379	archaeological	369
183	*43.20*	*26.60*	*Veliki_Preslav*	*Patlejna ceramic center*	*KL*	*1050*	*1100*	*1075*	*T*	*3*	*4.60*	*64.20*	*2.00*	*3916*	*3*	*1*	*60.20*	*2.21*	*	*THDL*	*892-894//896*	*archaeological*	*239,502*
369	**43.37**	**27.12**	**Pliska**	**Palace complex-kiln 2,sq.XX-321**	**KL**	**1000**	**1050**	**1025**	**TA**	**3**	**26.50**	**65.70**	**2.70**	**2156**	**6**	**6**	**70.03**	**1.33**	*****	**THpT**	**2574;2576;2595;2598;2599**	**archaeological**	**552**
255	41.80	24.80	Assenovgrad	Bachkovski_monastir-Ossuary	BR	1000	1050	1025	*	*	*	*	*	*	1	1	62.02	1.94	*	THkD	620	archaeological	197
186	41.42	23.20	Petrich	The remains of an ancient fire	BS	1014	1014	1014	T	5	17.51	59.59	5.48	196	5	5	65.14	3.82	*	THDL	1543-1559	historical	502
184	*43.37*	*27.10*	*Pliska*	*The king's estate-prefurnium; furnace*	*KL*	*950*	*1030*	*990*	*T*	*7*	*8.10*	*61.50*	*5.20*	*137*	*9*	*6*	*74.08*	*5.09*	*	*THDL*	*634-6391628-1645*	*archaeological*	*239,502*
180	*43.40*	*28.20*	*Balchik*	*Protobulgarian dwellings*	*HR*	*950*	*1020*	*985*	*T*	*4*	*9.92*	*69.86*	*3.60*	*628*	*2*	*1*	*80.11*	*8.00*	*	*THDL*	*1771-1784*	*archaeological*	*239,502*
182	43.70	28.50	Durankulak	The field - kiln's floor plasters	KL	970	1000	985	T	17	11.64	68.43	2.00	317	11	7	70.59	3.58	TRM;IRM	THkD/THpT	1763-1766//1785-1802	archaeological	502
368	**43.37**	**27.12**	**Pliska**	**Palace complex-kiln 1,sq.XX-363**	**KL**	**950**	**1000**	**975**	**TA**	**12**	**4.80**	**70.80**	**2.30**	**358**	**6**	**6**	**73.80**	**3.04**	*****	**THpT**	**2573; 2575;2577-2592**	**archaeological**	**552**
178	*43.20*	*26.82*	*Veliki_Preslav*	*The inner fortress wall*	*BR*	*900*	*950*	*925*	*T*	*4*	*	*61.25*	*4.50*	*162*	*4*	*4*	*78.06*	*7.54*	*	*THDL*	*742-748*	*archaeological*	*239,502*
175	44.10	26.80	Garvan	Slav settlement	HR	900	950	925	*	*	*	*	*	*	7	2	74.73	9.22	*	THDL	108-113	archaeological	502
174	*43.20*	*26.82*	*Veliki_Preslav*	*The monastery estate in the inner town*	*BR*	*900*	*950*	*925*	*T*	*7*	*	*71.21*	*2.53*	*513*	*10*	*9*	*84.03*	*9.24*	*	*THDL/THpT*	*896-910*	*archaeological*	*239,502*
173	*43.20*	*26.80*	*Vinitza*	*Ceramic center of the king's estate*	*KL*	*900*	*920*	*910*	*T*	*6*	*15.60*	*69.20*	*3.50*	*376*	*7*	*7*	*77.75*	*2.48*	*TRM;IRM*	*THDL/THpT*	*98-107*	*historical*	*239,502*
177	43.20	26.82	Veliki_Preslav	Ceramic center on the road to Patlejna	KL	900	920	910	T	4	21.02	71.89	6.52	200	3	3	72.30	3.09	TRM;IRM	THDL/THpT	93-97	archaeological	502
176	*43.20*	*27.90*	*Varna*	*Early Bulgarian dwelling*	*HR*	*880*	*940*	*910*	*T*	*13*	*11.40*	*64.30*	*3.80*	*117*	*8*	*5*	*72.32*	*4.05*	*	*THDL*	*1435-1459*	*historical*	*239,502*
179	*43.70*	*28.60*	*Durankulak*	*The island-Medieval horizon-kiln's floor*	*KL*	*870*	*920*	*895*	*T*	*8*	*12.30*	*64.30*	*7.00*	*64*	*5*	*4*	*61.76*	*0.42*	*	*THpT*	*B521-B531*	*archaeological*	*239,502*
181	43.20	27.60	Kipra	Slavonic ceramic center	KL	800	850	825	TA	13	10.19	57.62	2.39	301	10	9	62.12	5.62	*	THDL	1803-1818	archaeological	502
343	41.70	26.30	Kap. Andreevo	Early Medieval settlement	KL	780	820	800	TA	57	7.57	59.11	1.75	117	21	9	55.12	6.62	*	THpT	2449-2524	coins Yustinian VI	502
314	*43.40*	*28.30*	*Topola*	*Kilns under the roof of iron construction*	*KL*	*680*	*800*	*740*	*TA*	*6*	*353.80*	*70.30*	*4.80*	*196*	*6*	*6*	*62.29*	*3.53*	*TRM;IRM*	*THpT*	*2217-2226*	*archaeological*	*239,502*
170	43.50	23.20	Montana	Rego Montanensium-kiln floor&burnt soil	KL	600	760	680	TA	5	350.03	56.69	4.12	346	4	3	68.52	3.95	*	THDL	1506-1516	archaeological	197
172	43.10	25.70	Veliko_Tarnovo	Tzarevetz - burnt soils after the fire	BS	641	647	644	T	31	351.14	65.33	2.10	143	15	15	76.55	5.56	TRM;IRM	THDL/THpT	135-139//640-666//1574-1581	coins&inscription	502
367	**42.60**	**27.70**	**Nessebar**	**Early Byzantine furnace-the floor**	**KL**	**575**	**675**	**625**	**TA**	**4**	**348.00**	**66.70**	**2.50**	**1406**	*****	*****	*****	*****	*****	*****	**2547;2552;2557;2559**	**archaeological**	**239**

157	*43.60*	*25.60*	*Krivina*	*Jatrus-sqs X-T9; X-B; IX-O-Avar's invasion*	*BC*	*590*	*620*	*605*	*T*	*16*	*1.24*	*60.87*	*3.30*	*123*	*11*	*11*	*83.21*	*7.86*	*	*THDL*	*827-831//854-874*	*archaeological*	*239,502*
296	42.70	23.30	Sofia	Serdica-pottery oven No2 of L.Roman Age	BC	571	615	593	TA	18	5.80	58.70	1.90	324	11	8	72.68	2.90	ARM	THpT	2279-2304	coins-Emperor Yustin II	175
167	43.30	27.60	Sherba	Remains of a Late Roman kiln	KL	560	600	580	T	5	7.80	62.42	4.23	328	4	4	68.04	3.90	TRM;IRM	THpT	83-87	archaeological	197
149	43.20	27.90	Varna	The Basilica at Djanavar tepe	BR	500	600	550	T	4	*	57.88	2.66	464	6	5	65.99	5.58	TRM;IRM	THDL/THpT	302-305	archaeological	502
166	42.70	27.70	Nessebar	Roman town's wall	BR	540	560	550	T	5	*	62.96	5.22	121	7	5	60.84	4.00	TRM;IRM	THDL/THpT	376-381	seal Yustinian	502
171	*42.90*	*25.40*	*Drjanovski_mon.*	*Late Roman tower in Borunja district*	*BR*	*500*	*600*	*550*	*T*	*11*	*	*57.87*	*3.40*	*284*	*6*	*4*	*66.45*	*6.97*	*	*THDL/THpT*	*1124-1138*	*archaeological*	*239,502*
161	42.40	25.70	Hrishtene	Early Christian Basilica	BR	500	600	550	T	11	*	57.27	4.21	185	6	6	65.22	6.58	TRM;IRM	THDL/THpT	B207-B218	archaeological	502
163	42.68	26.33	Novo_selo	Well preserved furnace for bricks baking	KL	500	600	550	T	7	3.63	59.84	3.90	234	5	5	63.01	4.75	TRM;IRM	THDL/THpT	548-557	archaeological	502
165	*42.76*	*23.30*	*Bojana*	*Late Roman Buildings*	*BR*	*520*	*580*	*550*	*T*	*9*	*	*58.49*	*2.70*	*451*	*9*	*9*	*63.56*	*5.01*	*	*THDL*	*962-970*	*archaeological*	*239,502*
155	43.40	28.40	Kaliakra	Re-used L.Roman mat.in Medieval ch.	BR	500	600	550	T	15	*	61.89	3.56	259	12	9	64.86	6.15	*	THDL	358-367//79-82	archaeological	502
168	*43.20*	*27.70*	*Beloslav*	*Material from Dobreva chuka district*	*BR*	*500*	*600*	*550*	*T*	*5*	*	*61.76*	*4.38*	*171*	*3*	*3*	*63.23*	*3.46*	*	*THkD*	*240-246*	*archaeological*	*239,502*
160	43.20	27.45	Provadija	Re-used bricks in Ovechgrad fortress	BR	500	600	550	T	5	*	60.28	6.74	72	4	3	64.96	2.91	*	THDL	293-301	archaeological	502
150	42.70	23.30	Sofia	Serdica-South triangular tower;East door	BR	527	565	546	T	22	*	60.99	5.37	114	9	8	68.80	5.68	*	THDL	398-414//477-489//678-681	coins Yustinian	197
162	43.20	23.90	Gol._Belene	Late Roman basilica	BR	480	600	540	T	14	*	62.94	3.27	307	6	6	72.74	1.60	*	THkD/THpT	1230-1245	archaeological	502
256	44.00	22.50	Perilovetz	Late Roman fortress Bovonia	BR	520	560	540	T	2	*	70.30	1.41	*1653*	3	3	67.89	3.15	*	THkD	777-778	archaeological	197
244	42.30	22.65	Kustendil	Early Medieval sanctuary in Goranovtzi	KL	500	580	540	T	10	1.50	57.80	3.50	188	6	6	66.86	4.87	*	THDL	1933-1942	archaeological	502
202	*42.50*	*24.30*	*Strelcha*	*Re-used Roman bricks in Med. Fortress*	*BR*	*500*	*560*	*530*	*	*	*	*	*	*	*7*	*6*	*66.33*	*4.71*	*	*THDL/THpT*	*1596-1609*	*archaeological*	*239,502*
156	*43.50*	*27.10*	*Vojvoda*	*Roman Estate-burnt wall made by bricks*	*bBR*	*500*	*550*	*525*	*T*	*6*	*2.80*	*70.10*	*5.90*	*94*	*5*	*5*	*62.47*	*1.34*	*	*THDL*	*911-914//928-931*	*archaeological*	*239,502*
143	43.70	24.90	Nikopol	Christian church in a Roman domination	BR	440	600	520	T	7	*	69.30	2.91	388	3	3	53.48	1.16	*	THDL	802-809	archaeological	502
233	*43.10*	*24.70*	*Lovech*	*Med. church-re-used Late Roman bricks*	*BR*	*400*	*620*	*510*	*	*	*	*	*	*	*8*	*8*	*54.56*	*4.22*	*	*THDL*	*1139-1150*	*archaeological*	*239,502*
151	43.70	22.70	Macresh	Roman Basilica-unique abse	BR	450	550	500	TA	5	*	57.62	1.35	*1803*	5	4	59.11	2.66	*	THpT	771-776	archaeological	197
66	43.30	27.80	Varna_district	Early Byzantine fortress "Muhalijsko tepe"	BR	450	550	500	T	5	*	64.80	3.34	*295*	*	*	*	*	*	*	313-319	archaeological	197
158	43.20	27.80	Kisheshlika	Late antique fortress and settlement	BR	400	520	460	T	11	*	63.60	3.98	207	3	3	60.76	2.01	TRM;IRM	THpT	268-279	archaeological	502
145	*43.50*	*26.50*	*Razgrad*	*Roman town Abritus-fortress's East wall*	*BR*	*400*	*500*	*450*	*TA*	*5*	*	*54.56*	*5.40*	*113*	*2*	*2*	*63.96*	*0.67*	*	*THDL*	*1068-1076*	*archaeological*	*239,502*
164	*42.70*	*27.70*	*Nessebar*	*Western wall of the Roman town*	*BR*	*400*	*500*	*450*	*T*	*3*	*	*53.77*	*3.50*	*268*	*4*	*4*	*59.21*	*2.57*	*TRM;IRM*	*THDL/THpT*	*68-70*	*archaeological*	*239,502*
146	42.70	27.70	Nessebar	Roman public house	BR	400	500	450	TA	14	*	58.70	4.90	137	7	7	60.63	2.37	TRM;IRM	THDL/THpT	B175-B182//71-72	archaeological	502
142	*42.50*	*23.10*	*Kralev_dol*	*Roman villa*	*KL*	*400*	*480*	*440*	*TA*	*10*	*358.43*	*49.94*	*2.60*	*326*	*7*	*6*	*57.01*	*5.35*	*	*THpT*	*1151-1162*	*archaeological*	*239,502*
126	43.50	23.20	Kalimanitza	Roman cer.center-Rego Montanensium	KL	380	470	425	TA	28	1.52	58.99	2.02	183	10	9	65.71	4.14	*	THDL	1372-1380//1517-1542	archaeological	502
154	42.20	24.30	Pazardjik	Tzepina fortress-E.Bizantine ch.+dwell.	T	400	450	425	T	10	*	47.92	3.98	207	6	4	64.38	4.58	*	THkD	1003-1008//1016-1023//48//49	archaeological	502
120	*42.20*	*24.80*	*Plovdiv*	*Philipopol-a road after an ancient fire*	*BS*	*320*	*440*	*380*	*T*	*4*	*	*51.73*	*2.08*	*760*	*2*	*2*	*76.36*	*5.94*	*	*THDL*	*B242-B250*	*archaeological*	*239,502*
134	*41.50*	*26.10*	*Ivajlovgrad*	*Roman villa Armira - the fire, hypocaust*	*KL*	*376*	*378*	*377*	*T*	*5*	*352.82*	*48.09*	*5.40*	*201*	*5*	*5*	*71.33*	*2.40*	*	*THDL*	*161-6//382-97//1401-03//1428*	*archaeological*	*239,502*
128	43.20	25.30	Hotnitza	Roman ceramic center	KL	376	378	377	T	12	359.97	47.56	4.20	103	6	5	69.08	5.57	*	THDL	144//182-183//653-662	archaeological	197
136	42.50	25.70	Stara_Zagora	Roman site Chatalka-kiln's floor of bricks	bBR	350	400	375	T	5	354.95	53.42	6.10	88	7	7	57.35	2.92	*	THDL	200-211	archaeological	502
121	43.10	25.70	Butovo	Roman furnaces	KL	370	380	375	T	14	2.17	58.53	4.70	70	15	14	56.92	4.86	*	THDL	126-130//176//878-890	archaeological	197
135	41.70	25.70	Dolno_Botevo	Roman reservoir	BR	300	400	350	*	*	*	*	*	*	7	7	68.11	1.03	*	THDL	54-56//1260-1266	archaeological	502
130	42.70	23.30	Sofia	Serdica-E.Christian chuch "St. Georgue"	BR	300	380	340	T	12	*	51.43	5.62	104	6	5	68.13	6.30	*	THDL	415-423//709-714	archaeological	197
141	*42.70*	*23.30*	*Sofia*	*Serdica-East door-tower 2;West. column*	*BR*	*310*	*360*	*335*	*T*	*11*	*	*49.93*	*6.24*	*84*	*8*	*8*	*53.71*	*4.18*	*	*THDL*	*667-677//695-699*	*archaeological*	*239,502*
140	*43.50*	*27.10*	*Vojvoda*	*Late Roman fortress*	*BR*	*306*	*337*	*322*	*T*	*10*	*	*54.33*	*6.90*	*69*	*8*	*8*	*50.49*	*3.68*	*	*THDL*	*915-927//1646*	*seal Dules*	*239,502*
132	42.70	23.30	Sofia	Roman estate-farm buildings of Serdica	BR	250	350	300	T	4	*	48.07	6.58	76	5	5	64.36	2.27	*	THDL	44-47	archaeological	197
129	42.50	24.70	Hissarja	Diokletianopol-town gate and wall	BR	280	310	295	T	25	*	53.27	3.88	218	26	15	59.91	2.29	ARM	THDL/THpT	596-611//2305-2317	archaeological	502
123	43.60	25.35	Svishtov	Roman town Nove - furnaces	KL	270	300	285	T	9	359.67	55.20	5.20	122	7	7	67.84	1.55	*	THDL	115-123	archaeological	197

127	43.50	26.50	Razgrad	Roman town Abritus	BR	260	300	280	T	20	*	60.00	4.47	164	5	5	58.04	1.11	*	THDL	1077-1097	archaeological	197
125	43.10	25.70	Butovo	Roman construction&necropolis	BR	250	300	275	T	5	*	54.56	1.32	1886	4	4	56.56	2.91	*	THDL	124-125//174-175	archaeological	502
131	43.70	24.50	Gigen	Roman town Escues-a building; a bath	BR	200	300	250	T	18	*	59.84	5.27	118	7	7	66.36	5.46	*	THDL	752-770	archaeological	502
117	43.60	25.35	Svishtov	Roman town Nove - bricks	BR	200	300	250	T	2	*	50.20	0.28	41873	4	3	60.27	1.16	*	THDL	35-37	archaeological	197
122	43.20	26.50	Targoviste	Burnt stones in the ritual ovens	bST	200	250	225	*	*	*	*	*	*	2	2	71.55	0.96	*	THDL	1838-1846	archaeological	197
112	43.20	25.30	Pavlikeni	Furnaces-big Roman ceramic center	KL	200	240	220	T	49	351.62	58.30	1.90	111	23	23	61.69	5.40	*	THDL	1099-110//B158-69//1182-94	archaeological	197
113	*42.50*	*26.50*	*Jambol*	*Kabile - furnace*	*KL*	*150*	*250*	*200*	*T*	*7*	*358.34*	*65.13*	*4.79*	*143*	*7*	*6*	*68.74*	*3.82*	*	*THDL*	*B331-B343*	*archaeological*	*239,502*
116	42.50	25.70	Stara_Zagora	Augusta Trajana-Roman public houses	BR	170	220	195	T	29	*	55.16	5.65	103	10	9	75.97	5.85	*	THDL	184-188//1024-1048	archaeological	197
153	43.20	27.60	Devnja	Marcianopol-E.Chr.Basilica:re-used mat.	BR	170	200	185	T	8	*	54.05	5.88	95	1	1	51.43	3.00	*	THDL	333-340	archaeological	502
111	*43.20*	*25.50*	*Nikjup*	*Nikopolis ad Istrum*	*BR*	*170*	*190*	*180*	*T*	*11*	*	*58.72*	*4.31*	*177*	*6*	*6*	*51.80*	*3.53*	*	*THDL*	*132-134//1468-1478*	*coins*	*239,502*
148	*43.00*	*27.80*	*Bjala*	*Erite-Roman road station-re-used mat.*	*BR*	*140*	*220*	*180*	*T*	*8*	*	*58.42*	*1.94*	*873*	*4*	*4*	*49.01*	*4.82*	*	*THDL*	*257-267*	*archaeological*	*239,502*
115	43.20	27.60	Devnja	Marcianopol-gladiatorial's fight amphith.	BR	160	200	180	T	6	*	56.12	2.06	774	5	5	49.34	1.92	*	THDL	327-332	archaeological	553
110	*42.70*	*23.30*	*Sofia*	*Serdica - the monetary house*	*BR*	*176*	*180*	*178*	*T*	*17*	*	*58.94*	*4.00*	*205*	*9*	*6*	*63.27*	*3.69*	*	*THDL*	*1819-1837*	*coins*	*239,502*
104	43.20	27.90	Varna	The Roman thermes	BR	150	200	175	T	4	*	57.93	3.66	245	6	6	59.72	2.43	*	THDL	73-76	coins	553
109	42.50	25.70	Stara_Zagora	Augusta Trajana-the mineral baths	BR	162	163	163	T	21	*	58.78	4.81	142	5	5	55.05	4.94	*	THDL	715-724//B190-B206	inscription	197
124	*42.50*	*23.10*	*Kralev_dol*	*Roman villa*	*BR*	*120*	*200*	*160*	*T*	*13*	*	*58.77*	*4.71*	*148*	*6*	*6*	*80.11*	*4.60*	*	*THDL*	*1163-1180*	*archaeological*	*239,502*
106	43.60	25.60	Krivina	Jatrus-2d c.bricks in 3d c.building-sq.9F	BR	100	200	150	T	21	*	65.43	5.45	111	12	11	58.58	3.51	*	THDL	933-852	archaeological	197
103	41.90	25.60	Haskovo	The Roman mineral baths	BR	100	200	150	*	*	*	*	*	*	2	2	63.75	2.46	*	THDL	52-53	archaeological	197
108	*42.30*	*22.65*	*Kjustendil*	*Pautalia-the fortress wall and the citadel*	*BR*	*100*	*200*	*150*	*TA*	*18*	*	*60.14*	*4.41*	*169*	*14*	*11*	*65.08*	*3.95*	*	*THDL/THpT*	*953-961*	*archaeological*	*239,502*
240	42.90	23.00	Gaber	Antique building	BR	50	250	150	T	15	*	58.40	4.88	138	6	5	76.08	4.98	*	THDL	725-741	archaeological	197
105	43.20	25.00	Kalvaka	The tomb	BS	117	138	128	T	4	*	61.10	4.92	136	3	3	66.82	4.68	*	THDL	177-181	coins	197
284	43.80	22.80	Vartop	Jidkovetz-triangular brick	BR	117	138	128	*	*	*	*	*	*	3	3	61.27	2.66	*	THDL	38	inscription Hadrien	197
107	*42.20*	*24.80*	*Plovdiv*	*Roman Philipopol - the Forum*	*BR*	*100*	*150*	*125*	*T*	*9*	*	*59.53*	*4.47*	*164*	*3*	*3*	*66.76*	*4.64*	*	*THDL*	*B225-B241*	*archaeological*	*239,502*
102	43.60	27.70	Dobrogled	The East Roman fortress	BR	100	150	125	T	8	*	59.49	5.48	109	1	1	66.75	1.95	*	THkD	247-256	archaeological	502
114	41.50	26.10	Ivajlovgrad	Roman villa Armira	BR	100	140	120	T	24	*	56.92	5.13	125	22	16	67.61	3.96	*	THDL	388-394//1414-1427	archaeological	197
101	43.70	24.90	Nikopol	The Roman fortress - East part	BR	98	117	108	T	12	*	60.62	5.82	97	4	4	70.86	2.99	*	THkD	810-821	coins	197
99	42.50	25.90	Karanovo	Settlement-the furnace and the grave	BC	81	117	99	T	5	352.50	55.38	6.10	159	8	7	68.45	0.48	*	THDL	1610-1627	coins-Domician and Trajan	502
346	**43.64**	**25.59**	**Krivina**	**Lime workshop of Legio I Italica**	**BC**	**70**	**100**	**85**	**TA**	**10**	**353.44**	**60.56**	**2.54**	**364**	**6**	**6**	**66.51**	**2.80**	*	**THpT**	**Lv1-Lv10**	**coins-end of 1st c.AD**	**509**
347	**43.64**	**25.59**	**Krivina**	**Lime workshop of Legio I Italica**	**KL**	**70**	**100**	**85**	**TA**	**8**	**356.20**	**56.60**	**2.72**	**426**	**9**	**7**	**62.10**	**3.80**	*	**THpT**	**Lv11-Lv23**	**coins-end of 1st c.AD**	**509**
348	**43.64**	**25.59**	**Krivina**	**Lime workshop of Legio I Italica**	**KL**	**70**	**100**	**85**	**TA**	**23**	**356.26**	**57.29**	**1.93**	**246**	**20**	**18**	**67.20**	**4.50**	*	**THpT**	**Lv35-Lv59**	**coins-end of 1st c.AD**	**509**
98	42.70	23.30	Sofia	Roman town Serdica-the aquadukt	BR	50	120	85	T	5	*	57.58	4.43	167	2	2	70.48	5.16	*	THDL	403-407	archaeological	197
345	**43.64**	**25.59**	**Krivina**	**Roman pottery kiln**	**BC**	**-60**	**30**	**-15**	**TA**	**5**	**359.90**	**67.60**	**5.60**	**191**	**9**	**9**	**69.82**	**3.50**	*	**THpT**	**Lv24-Lv32**	**archaelogical;stratigraphy**	**509**
96	42.50	27.50	Burgas	Mandrensko ezero - Tursis	BC	-200	-100	-150	*	*	*	*	*	*	3	2	69.01	0.43	*	THDL	1654-1662	archaeological	197
253	*43.72*	*26.71*	*Isperih*	*Teke Demir Baba-Thracian sanctuary*	*BC*	*-280*	*-200*	*-240*	*T*	*32*	*354.66*	*67.36*	*1.58*	*259*	*28*	*26*	*62.25*	*5.12*	*	*THkD/THpT*	*1879-96//1918-26//1988-2002*	*archaeological*	*239,502*
274	43.72	26.71	Isperih	Tracian site at Water supply station	BC	-260	-240	-250	TA	21	350.23	63.22	1.84	298	26	23	71.85	3.91	TRM:IRM	THpT	2038-2065//2115-40	coins; inscriptions; seals	502
56	43.70	26.75	Isperih	Sborjanovo-hill28+fireplace-hill30(GSM)	BC	-300	-200	-250	TA	44	359.23	66.98	0.96	499	22	16	63.98	2.77	TRM;IRM	THpT	DG22-DG58//DG3-DG21	archaeological	502
279	*43.10*	*25.70*	*Veliko_Tarnovo*	*Thracian oven-the floor*	*BC*	*-350*	*-200*	*-275*	*	*	*	*	*	*	*12*	*12*	*70.44*	*2.95*	*	*THpT*	*VT1-VT8*	*archaeological*	*239,502*
100	42.24	25.22	Halka_Bunar	Pottery center-Thracia (Early Hellenistic)	BC	-280	-278	-279	TA	12	348.70	62.20	2.70	270	24	20	77.23	2.17	*	THpT	HB1-17//HB32-34	coins Demetrius, Polircete	173
277	*42.25*	*24.08*	*Vetren*	*Pistiros Emporion-hN1,r4+r2;sqB7,B1/B2*	*BC*	*-280*	*-279*	*-280*	*TA*	*5*	*347.10*	*66.20*	*5.20*	*217*	*18*	*17*	*74.29*	*6.70*	*TRM;IRM*	*THpT*	*2066-2094//2247-2255*	*archaeo;coins;graffiti*	*239,502*
93	*42.50*	*25.40*	*Kazanlak*	*Thracian town Seuthopolis-the tomb*	*BR*	*-320*	*-260*	*-290*	*T*	*6*	*	*66.98*	*4.21*	*185*	*9*	*7*	*80.29*	*7.46*	*	*THDL*	*27 28 32 33 34 39-43*	*coins&archaeological*	*239,502*
282	42.25	24.08	Vetren	Pistiros Emporion-altars-B'2,B'7	BC	-350	-300	-325	TA	15	348.45	64.00	2.22	260	6	1	68.34	5.10	TRM;IRM	THpT	2228-40//2263-70	coins; archaeol.; graffiti;	502

357	**42.65**	**27.72**	**Nessebar**	**Elinistic kiln**	**BC**	**-380**	**-280**	**-330**		**TA**	**7**	**350.30**	**69.60**	**2.90**	**430**	**18**	**8**	**67.58**	**4.81**	*****	**THpT**	**N1-N14**	**coin&archaeological**	**239**
283	*42.25*	*24.08*	*Vetren*	*Pistiros Emporion-baked floor-sq.B1*	*BC*	*-400*	*-350*	*-375*		*TA*	*9*	*348.29*	*58.21*	*3.03*	*290*	*9*	*8*	*60.59*	*5.87*	*TRM:IRM*	*THpT*	*2095-2100//2241-2246*	*coins; archaeol.; graffiti;*	*239,502*
92	43.10	24.30	Lazar_Stanevo	Mogila 25, Toros 174, oriented sample	BS	-420	-380	-400		T	3	352.70	60.70	2.60	2250	2	2	77.50	3.41	*	THDL	1665	archaeological	502
320	43.10	25.70	Veliko_Tarnovo	Two Thracian baked floors	BC	-500	-300	-400		TA	11	351.90	61.10	2.20	423	23	17	64.11	3.88	*	THpT	VT12-VT28	archaeological (ceramic)	370
362	**42.25**	**25.47**	**Malko_Tranovo**	**Remains of Elinistic ovens**	**BC**	**-500**	**-340**	**-420**		*****	*****	*****	*****	*****	*****	**10**	**8**	**75.44**	**3.44**	*****	**THpT**	**2404-2421**	**archaeological**	**239**
15	41.60	25.40	Kardzhali	Vishegrad-Iron Age (Thracia)-fired floor	BC	-560	-360	-460		*	*	*	*	*	*	2	2	75.14	0.85	*	THDL	1298-1299	archaeological	197
366	**42.42**	**27.70**	**Sozopol**	**Metallurgic ovens**	**BC**	**-500**	**-450**	**-475**		**TA**	**11**	**1.70**	**66.70**	**2.00**	**531**	**12**	**10**	**91.72**	**4.37**	**ARM**	**THpT**	**So27;So31-So36;So38;So41-47**	**archaeological**	**239**
365	**42.42**	**27.70**	**Sozopol**	**Big pottery oven**	**BC**	**-550**	**-500**	**-525**		**TA**	**21**	**350.70**	**63.00**	**2.40**	**177**	**10**	**8**	**87.83**	**5.78**	**ARM**	**THpT**	**So1-So15; So19-So24**	**archaeological**	**239**
88	42.20	24.80	Plovdiv	Nebet Tepe-Thracian town Evmolpia	BC	-800	-600	-700		T	3	356.32	65.70	1.40	3641	3	2	69.14	0.19	*	THDL	9-1 4//9-6/9//9-11	archaeological	197
90	*42.50*	*25.70*	*Stara_Zagora*	*Pshenichevo-Iron Age-destructions*	*BC*	*-1000*	*-800*	*-900*		*T*	*6*	*20.30*	*66.00*	*5.30*	*158*	*7*	*6*	*68.98*	*6.04*	*	*THDL*	*Psh1-Psh27*	*archaeological*	*239,502*
252	43.74	26.74	Isperih	Kamen Rid - Kaleto-Thracian fortress	HR	-1000	-900	-950		T	31	17.20	71.20	1.20	431	20	18	75.59	4.37	*	THkD	T1-T3//1901-1912//1959-1987	archaeological	197
356	**42.55**	**26.78**	**Malenovo**	**Early Iron Age**	**HR**	**-1012**	**-914**	**-963**		**TA**	**11**	**18.60**	**67.10**	**2.60**	**299**	*****	*****	*****	*****	*****	**THpT**	**Ma1-Ma20**	**14C(Poz-37808,809,810)**	**239**
87	42.20	24.80	Plovdiv	Nebet Tepe-Evmolpia-I-III hor. dwrd	BC	-1100	-1000	-1050		T	15	12.53	61.86	3.00	156	6	6	77.83	1.70	*	THDL	Pl1-Pl17;1-1,8,13,18,21;3	archaeol.-before TrojaVII	197
82	*43.70*	*28.60*	*Durankulak*	*Late Bronze-big pottery furnace-P13*	*KL*	*-1302*	*-986*	*-1144*		*T*	*10*	*352.50*	*61.60*	*3.00*	*266*	*6*	*4*	*73.63*	*1.77*	*	*THDL*	*Dk1-Dk16*	*14C(Bln-2571)*	*239,502*
316	*41.77*	*23.50*	*Blagoevgrad*	*Kajmenska chuka-Late Bronze-the fire*	*BS*	*-1391*	*-1130*	*-1261*		*	*	*	*	*	*	*10*	*9*	*69.37*	*3.89*	*TRM;IRM*	*THpT*	*2141-2155*	*14C(Beta-65858;67012;67013)*	*373*
80	*42.20*	*24.80*	*Plovdiv*	*Nebet Tepe-VI hor. dwrd - Late Bronze*	*BC*	*-1500*	*-1300*	*-1400*		*T*	*7*	*7.20*	*56.00*	*1.70*	*1213*	*5*	*5*	*68.06*	*2.51*	*	*THDL/THpT*	*5-1,5,11,15;6-1,6,11*	*archaeological*	*239,502*
84	41.60	25.40	Kardzhali	Vishegrad-Middle-Late Bronze	KL	-1600	-1400	-1500		T	3	2.50	58.92	3.90	978	3	3	68.40	1.74	*	THDL	1295-1297	archaeological	197
321	42.10	25.80	Galabovo	Middle Bronze Age-I+II hor.dwrd	HR	-1800	-1750	-1775		TA	46	2.29	60.41	1.57	181	21	18	60.57	5.24	TRM¦IRM	THpT/THpT	GB1-GB54	archaeological	502
85	*42.20*	*24.80*	*Plovdiv*	*Brezov highway - Bronze Age*	*BC*	*-1900*	*-1700*	*-1800*		*	*	*	*	*	*	*2*	*2*	*60.21*	*0.47*	*	*THDL*	*B219-B224*	*archaeol.&stratigraphy*	*239,502*
77	42.20	24.80	Plovdiv	Nebet Tepe-M.Bronze Age-dwelling No4	BC	-2100	-1950	-2025		T	6	9.54	56.34	6.13	120	5	5	63.30	3.90	*	THDL	Pl 8-Pl 13//Pl10-1,5,11	14C; relative chronology	502
79	42.20	24.30	Yunatzite	Multil.tell-III hor.dwrd-end of M.Bronze	HR	-2400	-2300	-2350	81//	TA	6	3.88	59.36	4.80	190	3	3	53.87	0.78	*	THDL	Yun1-Yun7	14C&stratigraphy	502
78	*42.50*	*26.00*	*Nova_Zagora*	*Tziganska Tell-III+IV hor.dwrd-M.Bronze*	*HR*	*-2559*	*-2204*	*-2382*	*76//*	*T*	*10*	*5.33*	*56.78*	*4.18*	*135*	*9*	*5*	*49.49*	*1.42*	*	*THpT*	*Nz34-Nz45*	*14C(Bln-1151,1255,1149,1153)*	*239,502*
304	*42.60*	*24.77*	*Dabene*	*Sarovka-apses house-Early Bronze IIB*	*BC*	*-2573*	*-2470*	*-2522*	*303//*	*T*	*30*	*351.33*	*51.26*	*1.80*	*214*	*21*	*14*	*53.67*	*1.95*	*TRM;IRM*	*THpT/THpT*	*Sa10-Sa67*	*14C(Bln-4903;4900)&strat.&syn.*	*239,502*
81	42.20	24.30	Yunatzite	Multil.tell-VII hor. downward-sq.L7	HR	-2575	-2475	-2525	71//79	T	5	1.31	58.55	4.22	330	3	3	52.45	2.39	*	THDL	Yun8-Yun14	14C&stratigraphy	502
76	42.50	26.00	Nova_Zagora	Tziganska tell-VII hor.dwrd-fired pitus	P	-2620	-2490	-2555	75//78	T	4	0.41	60.20	4.80	356	3	3	60.82	1.18	*	THkD/THpT	Nz5-Nz10	14C(Bln-1150,50A,54,54A)&strat.	502
303	*42.60*	*24.77*	*Dabene*	*Under the apses house E.Bronze II*	*HR*	*-2620*	*-2500*	*-2560*	*43//304*	*T*	*9*	*359.69*	*52.14*	*3.53*	*213*	*5*	*5*	*55.30*	*1.95*	*	*THpT*	*Sa1-Sa9*	*relative chronology*	*239,502*
325	*41.63*	*24.40*	*Trigrad*	*Haramijska hole-Trans.period LE-EB*	*HR*	*-2620*	*-2520*	*-2570*	*65//*	*TA*	*10*	*354.14*	*47.99*	*3.90*	*152*	*7*	*5*	*46.47*	*0.83*	*	*THkD*	*HD11-HD20*	*archaeological*	*239,502*
278	*42.30*	*26.00*	*Dyadovo*	*Multil.tell-II hor.dwrd-sq.K24,S24*	*HR*	*-2640*	*-2500*	*-2570*	*280//*	*TA*	*12*	*0.28*	*58.37*	*3.30*	*169*	*7*	*6*	*54.13*	*1.57*	*	*THkD/THpT*	*D19-28//D58-D60*	*archaeol.&stratigraphy*	*239,502*
309	42.12	26.08	Galabovo	IV+Vhor.dwrd-sq.18-20;EBAII-III,Mihalich	HR	-2650	-2500	-2575		TA	19	354.10	51.40	1.12	253	15	14	45.53	3.89	TRM¦IRM	THpT/THpT	M1 - M31	relative chronology	502
280	*42.30*	*26.00*	*Dyadovo*	*Multil.tell-III hor.dwrd-M26,M27,M28,S25*	*HR*	*-2695*	*-2535*	*-2615*	*281//278*	*TA*	*35*	*2.42*	*56.66*	*1.50*	*249*	*12*	*12*	*52.92*	*4.62*	*	*THpT*	*D29-D56//D63-D78*	*archaeol.&stratigraphy*	*239,502*
71	42.20	24.30	Yunatzite	Multil.tell - X hor.dwrd-Bronze Age	HR	-2700	-2600	-2650	64//81	T	10	5.20	55.98	2.31	440	8	6	44.69	3.01	*	THDL	Yun30-Yun39	14C&stratigraphy	502
281	*42.30*	*26.00*	*Dyadovo*	*Multil.tell-IV hor.dwrd-sq.P20,R-S-T19-20*	*HR*	*-2700*	*-2620*	*-2660*	*289//280*	*TA*	*14*	*357.94*	*59.19*	*2.62*	*232*	*6*	*6*	*62.56*	*1.71*	*	*THpT*	*D80-D91//D115-D120*	*archaeol.&stratigraphy*	*239,502*
75	*42.50*	*26.00*	*Nova_Zagora*	*Tziganska Tell-VIII hor.dwrd-E.Bronze*	*HR*	*-2866*	*-2461*	*-2664*	*//76*	*	*	*	*	*	*	*8*	*5*	*53.75*	*3.34*	*	*THpT*	*Nz1-Nz4//Nz12-Nz18*	*14C(Bln-1576A)*	*239,502*
64	42.20	24.30	Yunatzite	Multil.tell - XI hor.dwrd-Bronze Age	HR	-2730	-2650	-2690	70//71	T	8	358.88	52.10	2.34	559	7	3	58.16	3.48	*	THDL	Yun22-Yun29	14C&stratigraphy	502
74	42.20	24.80	Plovdiv	Nebet Tepe-E.Bronze-phaze Mihalic	BC	-2750	-2650	-2700		T	8	1.00	56.20	2.00	746	5	4	49.62	0.76	*	THDL	7-1,6,9,11,21; 8-1,5,8,16	14C&archaeol.culture	197
70	42.20	24.30	Yunatzite	Multil.tell-XII hor. dwrd-Bronze	BC	-2770	-2690	-2730	83//64	T	7	1.10	52.10	4.30	194	10	6	53.41	4.58	*	THDL	Yu15-Yu21//Yu40-Yu45	14C&stratigraphy	502
43	42.50	24.90	Sarovka	Trench H18-4-1st lev.dwrd-beg.E.Bronze	BC	-2875	-2624	-2750	193//303	TA	4	359.90	55.10	4.20	478	4	3	46.30	2.10	*	THpT	CA68//CA73-CA76//CA120	14C (Bln-5231)	502
289	*42.30*	*26.00*	*Dyadovo*	*Multil.tell-V hor.dwrd-sq.P19; Q23*	*HR*	*-2873*	*-2634*	*-2754*	*290//281*	*TA*	*7*	*359.58*	*51.74*	*3.40*	*316*	*6*	*5*	*50.49*	*1.81*	*	*THpT*	*D121-D123//D127-D132*	*14C(Bln-3866;3868-71)*	*239,502*
275	42.20	26.10	Staroseletz	Early Bronze-second half	HR	-2850	-2750	-2800		TA	11	356.97	61.75	4.90	85	5	5	40.07	1.80	*	THkD	Str1-Str13	rel.chronology&stratigraphy	197
193	42.50	24.90	Sarovka	Trench H18-4-2d lev.dwrd+sq.P16	BC	-2850	-2750	-2800	221//43	TA	10	6.70	52.40	2.45	389	5	3	48.67	1.38	*	THpT	CA79//83-89//91//93//110//112	stratigraphy	502
286	*42.50*	*26.00*	*Ezero*	*Multil.tell - X hor. dwrd - Bronze Age*	*BC*	*-2923*	*-2701*	*-2812*	*69//*	*	*	*	*	*	*	*3*	*3*	*45.06*	*2.48*	*	*THDL*	*533-535*	*14C(Bln-725-7;Bln-1835)*	*239,502*

290	*42.30*	*26.00*	*Dyadovo*	*Multil.tell-VI hor.dwrd-sq. Q23,P23,O23*	*HR*	*-2866*	*-2766*	*-2816*	*291//289*	*TA*	*7*	*3.51*	*55.63*	*3.33*	*328*	*7*	*4*	*43.00*	*2.25*	*	*THpT/THpT*	*D133-D140*	*rel.chronology&stratigraphy*	*239,502*
83	42.20	24.30	Yunatzite	Multil.tell-XVI hor.dwrd-sq.O6/O5	HR	-2880	-2820	-2850	272//70	TA	12	355.46	60.20	1.50	749	5	5	43.22	3.65	*	THkD	Yu46-Yu58	14C;archaeol.&strat.&synchron.	502
291	*42.30*	*26.00*	*Dyadovo*	*Multil.tell-VII hor.dwrd-sq.S23,U25,O19*	*HR*	*-2906*	*-2806*	*-2856*	*292//290*	*TA*	*32*	*358.16*	*57.68*	*1.14*	*450*	*26*	*23*	*50.92*	*5.38*	*TRM;IRM*	*THpT/THpT*	*D92-114//D157-162//D192-207*	*relative chronology*	*239,502*
272	42.20	24.30	Yunatzite	Multil.tell-XVII hor.dwrd-Early Bronze	HR	-3000	-2800	-2900	273//83	TA	37	358.83	57.88	1.24	364	9	8	43.26	1.38	*	THkD	Yu59-Yu94//Yu104	14C;archaeol.&strat.&synchron.	502
221	*42.50*	*24.90*	*Sarovka*	*Trench H18-3d lev.dwrd+sq.P16*	*BC*	*-3000*	*-2800*	*-2900*	*245//193*	*TA*	*8*	*357.20*	*56.60*	*3.30*	*276*	*6*	*6*	*38.97*	*2.07*	*	*THpT*	*CA94-102//CA114,118,119*	*stratigraphy*	*239,502*
317	*42.30*	*26.00*	*Dyadovo*	*Multil.tell-Supp. XIV hor.dwrd (borehole)*	*HR*	*-3000*	*-2800*	*-2900*		*T*	*	*	*	*	*	*1*	*1*	*41.32*	*2.96*	*	*THkD*	*D7-D14*	*stratigraphy*	*239,502*
292	*42.30*	*26.00*	*Dyadovo*	*Multil.tell-VIIIhor.dwrd-U24,V25,P20-21*	*HR*	*-2956*	*-2856*	*-2906*	*50//291*	*TA*	*44*	*357.48*	*57.98*	*1.23*	*305*	*26*	*25*	*41.17*	*3.95*	*	*THpT*	*D98-101//D105-110//D124-126*	*rel.chronology&stratigraphy*	*239,502*
97	***42.30***	***26.00***	**Dyadovo**	**Multil.tell-Japon sector L23**	**HR**	**-2975**	**-2875**	**-2925**		**TA**	**26**	**1.11**	**58.60**	**1.47**	**374**	**12**	**9**	**40.36**	**2.57**	*	**THpT**	**D210-D249**	**relative chronology**	**239, 554**
50	*42.30*	*26.00*	*Dyadovo*	*Multil.tell-IX hor.dwrd-sqs.P23,P24,P27*	*BC*	*-3000*	*-2900*	*-2950*	*//292*	*T*	*18*	*358.91*	*54.56*	*1.57*	*460*	*20*	*15*	*48.52*	*2.59*	*TRM;IRM*	*THpT*	*D250-275//D172-173*	*rel.chronology&stratigraphy*	*239*
350	**42.57**	**26.98**	**Dragantzi**	**Early Bronze-fired remains**	**BC**	**-3000**	**-2900**	**-2950**		*	*	*	*	*	*	**11**	**9**	**46.78**	**2.49**	*	**THpT**	**Dr1-Dr28**	**archaeological;synchron.**	**239,520**
68	42.30	*26.00*	Dyadovo	Multil.tell-Supp.XVI hor.dwrd (borehole)	HR	-3000	-2900	-2950		*T*	4	359.49	58.84	4.63	395	2	2	41.12	2.22	*	*THDL*	D1-D6	archaeological	197
69	*42.50*	*26.00*	*Ezero*	*Multil.tell Ezero-XII+XIII hor.dwrd-Bronze*	*BC*	*-3016*	*-2910*	*-2963*	*53//286*	*T*	*9*	*355.67*	*57.54*	*1.83*	*788*	*9*	*9*	*44.44*	*2.95*	*	*THDL*	*520-522//528-530//541-547*	*14C(Bln-1156,1841,1786..._*	*239,502*
245	*42.50*	*24.90*	*Sarovka*	*Trench H18-4:4+5th lev.dwrd+sq.P17*	*BC*	*-3100*	*-2900*	*-3000*	*//221*	*TA*	*11*	*4.28*	*54.52*	*1.64*	*772*	*10*	*9*	*42.85*	*2.91*	*	*THpT*	*CA123-131//CA104-109*	*14C(Bln-5233),strat&rel.chronology*	*239,502*
359	**42.30**	**26.00**	**Dyadovo**	**Multil. tell-beg.E.Bronze-central profile**	**BC**	**-3100**	**-2900**	**-3000**	**//50**	**TA**	**61**	**0.90**	**55.40**	**1.20**	**218**	**25**	**21**	**44.67**	**2.42**	*	**THpT**	**D279-D380**	**archaeological**	**239,520**
360	**42.30**	**26.00**	**Dyadovo**	**Multil. tell-beg.EB-ovens2010-O13/14**	**BC**	**-3082**	**-2921**	**-3002**	**//50**	**TA**	**31**	**356.10**	**55.00**	**1.40**	**338**	**11**	**11**	**44.03**	**1.19**	*	**THpT**	**D381-D415**	**14C(PLD16899-16901)**	**239,520**
67	43.10	25.50	Hotnitza	Vodopada -I+II hor.dwrd-TP LE-EB	BC	-3772	-3657	-3715		TA	74	1.41	61.61	1.30	149	25	25	52.18	5.42	*	THDL	H1-H79	14C(Bln-3680-3685)	502
62	*41.60*	*24.30*	*Trigrad*	*Jagodinska cave-2 hor.upwrd - LE-EB*	*HR*	*-3940*	*-3706*	*-3823*		*TA*	*16*	*353.60*	*55.20*	*1.90*	*361*	*10*	*9*	*54.26*	*5.52*	*	*THDL*	*Ja1-Ja11//Ja17-Ja25*	*14C(Bln-2247;2249;2250)*	*239,502*
133	43.50	23.50	Galatin	Chukata-Transition period LE-EB	HR	-4050	-3900	-3975		T	15	355.65	51.33	3.80	99	9	8	43.93	1.54	*	THkD	G1-G27	(14C) archaeological	197
65	*41.60*	*24.40*	*Trigrad*	*Haramijska hole-B8/9;D3;C6-TP LE-EB*	*HR*	*-4038*	*-3949*	*-3994*		*TA*	*17*	*357.60*	*53.40*	*2.70*	*172*	*12*	*9*	*50.39*	*0.13*	*	*THkD*	*HD1-HD10//HD21-HD28*	*14C (Bln-3340-3345)*	*239,502*
63	42.12	23.68	Rebarkovo	Djugera - Transition period LE-EB	BC	-4160	-4000	-4080		*	*	*	*	*	*	7	6	39.38	4.06	*	THDL	Dj1-Dj10	archaeological	502
57	43.10	23.78	Krivodol	I hor.upwrd-L.Eneolithic-KVI-Salkuca	HR	-4150	-4050	-4100		T	27	5.11	50.25	2.20	160	13	13	39.22	3.99	*	THDL	Kr1-Kr32	archaeol.&stratigraphy	197
61	*43.30*	*24.30*	*Telish*	*Trans.per.LE/E.Bronze-III(IV) hor.upwrd*	*BC*	*-4230*	*-3995*	*-4113*	*60//*	*T*	*12*	*352.32*	*53.48*	*4.36*	*100*	*7*	*5*	*46.70*	*2.50*	*	*THDL*	*T35-T45//T66-T68*	*14C(Bln-2663;2241-44;2388)*	*239,502*
60	*43.30*	*24.30*	*Telish*	*Trans. per. LE/E.Bronze-II hor.upwrd*	*BC*	*-4150*	*-4080*	*-4115*	*59//61*	*T*	*10*	*359.03*	*54.41*	*4.33*	*126*	*8*	*8*	*46.00*	*3.02*	*	*THDL*	*T12-T24//T29-T34//T56-T60*	*stratigraphy*	*239,502*
273	42.20	24.30	Yunatzite	Multilevel tell-Eneolithic horizon	HR	-4160	-4080	-4120	//272	TA	8	15.33	48.07	2.60	454	3	3	37.68	1.04	*	THkD	Yun96-Yun103	14C; rel.chronology; stratigr.	502
288	41.90	25.00	Dolnoslav	Lopkite-burnt hor.-KVI cult.end of Eneol.	BC	-4170	-4070	-4120		T	45	10.64	46.90	1.59	179	8	8	38.43	3.69	*	THkD	Dl1-Dl47	rel.chronology&14C	197
33	43.50	23.20	Bagachina	Burnt horizon - the end of Eneolithic	BC	-4200	-4050	-4125		T	15	8.85	50.00	2.51	232	9	7	49.33	3.62	*	THkD	B1-B23	archaeological	197
58	43.20	23.70	G._Kremena	The end of Eneolithic	BC	-4210	-4070	-4140		*	*	*	*	*	*	8	7	52.15	4.40	*	THDL/THpT	B377-B385	archaeological	502
59	43.30	24.30	Telish	Transition period LE/EB-I(II) hor.upwrd	BC	-4200	-4100	-4150	//60	T	12	7.77	52.98	4.16	110	8	8	45.84	3.25	*	THDL	T1-T11//T25-T28//T46-T55	stratigraphy	502
45	43.20	27.90	Varna	Chernook-L.Eneolithic-KVI-burnt dwell.	BC	-4300	-4000	-4150		*	*	*	*	*	*	3	3	51.10	5.26	*	THDL	320-324	archaeological	502
52	43.00	27.50	Gol._Delchevo	Multul.tell-XIV hor.upwrd - L. Eneolithic	HR	-4200	-4150	-4175	51//	T	12	4.98	49.43	2.70	254	12	9	45.55	5.36	*	THDL	213-224	archaeol.&stratigraphy	197
51	43.00	27.50	Gol._Delchevo	Multil.tell - XIII hor.upwrd - L. Eneolithic	HR	-4250	-4200	-4225	35//52	T	10	6.65	45.95	1.90	646	11	11	39.23	4.93	*	THDL	226-239	archaeol.&stratigraphy	197
297	43.85	26.00	Russe	Eneolithic tell-I hor.dwrd-L.Eneolithic	HR	-4300	-4200	-4250	298//	TA	29	6.50	48.80	2.20	142	7	3	40.93	3.82	*	THpT	Rs15-Rs44	rel.chronology&stratigraphy	502
49	43.10	27.00	Smjadovo	Multil.tell-II hor.dwrd-Eneolithic	BC	-4320	-4240	-4280	254//	T	21	2.10	48.70	3.54	84	11	10	48.00	3.84	*	THDL	Sm1-Sm36	rel.chronology&14C	502
298	43.85	26.00	Russe	Multil.tell-II hor.dwrd-sq.N14,M10-LE	HR	-4350	-4250	-4300	299//297	TA	16	8.36	46.59	2.68	190	5	5	36.14	1.64	*	THpT	Rs1-Rs13//Rs30-Rs34	rel.chronology&stratigraphy	197
53	42.50	26.00	Ezero	Multil.tell-XIV-XVI hor.dwrd-Early Bronze	HR	-4350	-4290	-4320	//69	T	3	6.63	51.56	4.80	659	11	10	47.20	4.72	*	THDL	151-157//510-527	(14C) archaeol.&stratigraphy	197
254	43.10	27.00	Smjadovo	Multil.tell-III hor.dwrd-Eneolithic	BC	-4380	-4280	-4330	//49	T	7	11.80	44.10	2.90	415	3	3	42.68	2.93	*	THDL	BSm37-BSm47	archaeol.&stratigraphy	197
55	*43.20*	*27.10*	*Ovcharovo*	*Eneolithic tell-XII hor.upwrd-L.Eneol.*	*BC*	*-4445*	*-4240*	*-4343*	*47//*	*	*	*	*	*	*	*5*	*5*	*35.42*	*5.07*	*	*THDL*	*O22-O26*	*14C(Bln-1357, 1358)*	*239,502*
307	*43.70*	*28.60*	*Durankulak*	*Multil.tell-IVa hor.dwrd-dwell.9a,4z-LE III*	*HR*	*-4446*	*-4257*	*-4352*	*306//*	*TA*	*8*	*11.60*	*47.35*	*4.37*	*162*	*8*	*4*	*42.24*	*1.01*	*	*THpT*	*Dk30-Dk46*	*14C(Bln-2121, 2111)*	*239,502*
306	*43.70*	*28.60*	*Durankulak*	*Multil.tell-V hor.dwrd-dwell.9,7-LE II*	*HR*	*-4400*	*-4300*	*-4350*	*295//307*	*TA*	*10*	*8.08*	*52.19*	*5.10*	*91*	*12*	*10*	*42.24*	*2.12*	*	*THpT*	*Dk36-Dk55//Dk82-Dk88*	*rel.chronology&14C&stratigr.*	*239,502*
47	*43.20*	*27.10*	*Ovcharovo*	*Multil.tell-VIII+IX+Xhor.upwrd-LE*	*HR*	*-4450*	*-4350*	*-4400*	*305//55*	*TA*	*9*	*6.60*	*48.40*	*5.10*	*104*	*23*	*17*	*45.23*	*4.70*	*	*THDL*	*O1-O5//O12-O20//O27-31*	*(14C) stratigraphy*	*239,502*
299	43.85	26.00	Russe	Multil.tell-III hor.dwrd-sq.K8-L.Eneolithic	HR	-4460	-4380	-4420	300//298	*	*	*	*	*	*	5	5	42.77	2.80	*	THpT	Rs25-Rs29//Rs45-Rs49	rel.chronology&stratigraphy	197

295	*43.70*	*28.60*	*Durankulak*	*Multil.tell-VI hor.dwrd-dwell.3-10-LE I*	*HR*	*-4475*	*-4375*	*-4425*	*351//306*	*TA*	*24*	*2.68*	*45.52*	*0.90*	*93*	*12*	*12*	*47.64*	*1.54*	*	*THDL*	*Dk57-Dk91*	*relative chronology*	*239,502*
46	43.30	26.60	Poljanitza	Multil. tell-VII+VIII hor.upwrd-unoriented	HR	-4480	-4380	-4430	44//	*	*	*	*	*	*	6	6	44.36	3.51	*	*THDL*	P68-P71	archaeo&stratigr.	197
31	42.40	25.60	Stara_Zagora	Chatalka site-KV-KVI cult.-L.Eneolithic	HR	-4550	-4400	-4475		T	8	8.73	52.89	4.30	163	4	3	50.50	3.28	*	THDL	189-198	archaeological	502
48	43.10	26.10	Omurtag	Prehistoric tell - beg. of Late Eneolithic	HR	-4560	-4400	-4480		TA	4	13.90	47.70	5.80	250	6	5	54.53	1.63	*	THkD	12-1 6 11 16	(14C) rel.chronology	502
351	**43.70**	**28.60**	**Durankulak**	**Multil.tell-VII hor.dwrd-ME-L.Hamandjia**	**BC**	**-4575**	**-4425**	**-4500**	**//295**	**TA**	**28**	**8.00**	**53.30**	**1.80**	**226**	**11**	**11**	**46.36**	**4.45**	*****	**THpT**	**Dk92-Dk130**	**relative chronology**	**239**
305	43.20	27.10	Ovcharovo	Multil.tell-VII hor.upwrd-M.Eneolithic	HR	-4520	-4480	-4500	39//47	*TA*	2	10.60	53.70	5.00	421	4	4	47.72	3.36	*	THpT	O9-O11//OF	(14C) archeol.&stratigraphy	197
37	*43.60*	*27.40*	*Pet_mogili*	*Eneolithic tell - Middle Eneolithic*	*BC*	*-4550*	*-4450*	*-4500*		*	*	*	*	*	*	*5*	*5*	*51.31*	*4.24*	*	THDL	*B494-B514*	*archaeological*	*239,502*
315	42.50	25.90	Karanovo	Multil.tell-KV-KVI culture-Late Eneolithic	HR	-4600	-4400	-4500		TA	5	3.75	50.52	4.16	339	6	5	48.35	0.67	*	THDL	Kn9//Kn14//Kn18//Kn20-21	rel.chronology&stratigraphy	197
40	43.30	26.50	Liljak	Undigged Eneolithic tell	BC	-4580	-4440	-4510		T	6	16.30	58.70	5.10	167	8	8	43.54	3.80	*	THDL	L1-L14	archaeol.&rel.chronology	197
44	*43.30*	*26.60*	*Poljanitza*	*Multil.tell-IV hor.upwrd-M.Eneolithic*	*HR*	*-4560*	*-4460*	*-4510*	*36//46*	*T*	*15*	*13.50*	*59.90*	*2.70*	*202*	*14*	*8*	*43.30*	*5.65*	*	*THDL*	*P1-P32*	*archaeol.&stratigraphy*	*239,502*
34	43.50	26.50	Radingrad	Multil.tell-0+I+III hor.dwrd-Bojan IV	HR	-4600	-4450	-4525		TA	17	10.59	55.30	2.76	168	11	10	58.79	4.28	*	THDL/THpT	B469-B493	relative chronology	502
300	43.85	26.00	Russe	Multil.tell-V hor.dwrd-sq.E6,N9-M.Eneol.	HR	-4580	-4540	-4560	301//299	AF	4	14.50	52.31	1.64	3141	1	1	44.45	1.26	*	THkD	Rs50-Rs53	rel.chronology&stratigraphy	197
35	43.00	27.50	Gol._Delchevo	Multil.tell-IV hor.upwrd-M. Eneolithic	HR	-4600	-4550	-4575	6//51	T	5	15.27	53.27	4.70	257	12	12	49.43	3.50	*	THkD	490-508	archaeol.&stratigraphy	197
287	42.70	23.30	Sofia	Podujane-Eneolithic house No1-Vinca	BC	-4650	-4500	-4575		*	*	*	*	*	*	6	6	44.17	2.24	*	THkD	Po1-Po10	relative chronology	197
257	42.17	23.10	Slatino	Multil.tell-I hor. dwrd-Early Eneolithic	HR	-4630	-4530	-4580	30//	T	10	14.90	54.50	3.90	303	5	4	51.06	1.62	*	THkD	Sl21-Sl33	relative chronology	197
301	43.85	26.00	Russe	Multil.tell-VI hor.dwrd-sq.K6,M6,I5-ME	HR	-4650	-4550	-4600	302//300	TA	22	9.22	54.11	2.46	160	10	7	49.48	2.91	*	THpT	Rs54-Rs86	rel.chronology&stratigraphy	197
39	43.20	27.10	Ovcharovo	Multil.tell-V hor.upwrd-M. Eneolithic	HR	-4630	-4570	-4600	32//305	T	8	4.31	53.72	2.52	485	7	7	48.63	4.95	*	THDL	O32-O39//O49	(14C) archaeol.&stratigraphy	197
38	43.50	23.50	Gradeshnitza	Eneolithic site-KV;Maritza;Gumelnitza I	HR	-4665	-4565	-4615		T	12	7.11	54.25	6.10	51	7	7	49.71	2.94	*	THDL	779-801	archaeological	197
32	*43.20*	*27.10*	*Ovcharovo*	*Multil.tell-IV hor. upwrd-Early Eneolithic*	*HR*	*-4700*	*-4580*	*-4640*	*276//39*	*T*	*5*	*10.30*	*44.40*	*4.10*	*356*	*6*	*6*	*51.99*	*6.24*	*	*THDL*	*O40-O46*	*stratigraphy*	*239,502*
276	43.20	27.10	Ovcharovo	Multil.tell-III hor. upwrd-Early Eneolithic	HR	-4730	-4630	-4680	5//32	T	2	9.80	46.70	5.00	900	2	2	51.08	0.91	*	THDL	O47-O48	(14C) rel.chronology	197
30	*42.17*	*23.10*	*Slatino*	*II hor.dwrd-hearths,burnt equipm.-EE*	*HR*	*-4750*	*-4650*	*-4700*	*//257*	*T*	*13*	*8.60*	*45.10*	*4.30*	*93*	*8*	*8*	*42.17*	*3.52*	*	*THDL*	*Sl1-Sl13*	*archaeol.&rel.chronology*	*239,502*
36	*43.30*	*26.60*	*Poljanitza*	*Multilevel tell-I+II+III hor. upwrd*	*HR*	*-4790*	*-4620*	*-4705*	*//44*	*T*	*19*	*12.10*	*52.50*	*2.00*	*273*	*14*	*6*	*47.58*	*5.29*	*	*THDL*	*P33-P45//P50-P66*	*(14C) archaeol.&stratigraphy*	*239,502*
28	*42.00*	*23.10*	*Blagoevgrad*	*Strumsko-Early Eneolithic II hor.*	*HR*	*-4981*	*-4730*	*-4856*		*	*	*	*	*	*	*3*	*3*	*51.31*	*3.60*	*	*THDL*	*Bl1-Bl3*	*14C(Bln-2611,12)*	*239,502*
27	43.40	24.20	Brenitza	Early Eneolithic site-KIV, KV cultures	HR	-4900	-4840	-4870		T	15	14.18	49.86	2.60	205	13	12	53.26	5.92	*	THDL	B356-B376	archaeological	197
26	41.90	23.50	Eleshnitza	Late Neolithic site - KIV culture	HR	-5130	-4930	-5030		T	16	3.37	56.46	1.90	343	8	8	51.35	3.25	*	THDL	E5-E23	relative chronology	197
25	42.50	26.00	Nova_Zagora	Industrial bakery-L.Neolithic-KIV culture	HR, BC	-5150	-4950	-5050		TA	5	18.19	53.39	5.07	228	6	6	54.94	3.91	*	THDL	Nz20-Nz33	(14C) rel.chronology	502
260	*41.40*	*23.30*	*Topolnitza*	*Multil.tell-III hor.dwrd-KIV-Kremenitza-LN*	*BC*	*-5215*	*-5010*	*-5113*		*T*	*13*	*18.04*	*52.12*	*4.70*	*78*	*7*	*4*	*51.23*	*4.71*	*	*THDL/THpT*	*To3-To20//KP3*	*14C(Bln-3348,49,Bln-3381,82)*	*239,502*
24	*43.10*	*25.70*	*Kachitza*	*Neolithic-VIII-th sector-KIV,Vincha A cult.*	*BC*	*-5218*	*-5032*	*-5125*		*T*	*7*	*9.71*	*49.53*	*4.25*	*203*	*15*	*13*	*49.21*	*5.66*	*	*THDL*	*B314-B327//K1-K13*	*14C(Bln-1685,86,87)*	*239,502*
293	43.70	25.30	Koprivetz	IV hor. upwrd-Late Neolithic	HR	-5200	-5100	-5150	294//	TA	6	22.40	45.08	5.48	317	4	4	45.94	0.66	*	THpT	Kp 1 - Kp 6	relative chronology	502
302	43.85	26.00	Russe	Multilevel tell-VII hor.dwrd-LN-Bojan	HR	-5220	-5110	-5165	//301	AF	2	22.76	57.70	3.15	6307	2	2	46.80	1.84	*	THkD/THpT	Rs82-Rs83	rel.chronology&stratigraphy	502
17	43.10	25.60	Samovodene	Multil.tell-II+III+IV hor.dwrd-M.Neolithic	HR	-5325	-5125	-5225	19//	T	12	10.30	64.10	4.10	111	7	7	44.65	1.30	*	THkD	C'30-C'35//C'51-C'58;	rel.chronology&stratigraphy	197
16	43.30	26.50	Podgoritza	Middle Neolithic site-KIII culture	BC	-5290	-5190	-5240		T	4	12.20	57.60	3.70	624	7	7	46.62	4.48	*	THDL	11-1 5 11 16	relative chronology	197
263	43.30	26.20	Popovo	The reserve-Neolithic-KIII-KIV cult.	HR	-5320	-5180	-5250		T	39	6.60	58.60	1.90	133	8	8	38.23	2.54	*	THkD/THpT	R1-R46	relative chronology	502
353	**43.08**	**25.35**	**Orlovka**	**Neolithic setlement**	**BC**	**-5316**	**-5216**	**-5266**		**TA**	**24**	**8.20**	**58.10**	**2.70**	**123**	**10**	**9**	**40.67**	**2.64**	*****	**THpT**	**Or1-Or33**	**14C(KN-5766, 5769)**	**239**
18	*42.60*	*25.40*	*Kazanlak*	*Multil.tell-III+IV+V hor.dwrd-Neolithic-KIII*	*HR*	*-5482*	*-5053*	*-5268*	*13//*	*T*	*30*	*11.98*	*54.04*	*1.30*	*379*	*30*	*25*	*40.59*	*5.58*	*	*THDL*	*65-67//434-476*	*14C(Bln-729)*	*239,502*
23	43.10	27.40	Dalgopol	Usoeto - KIII-KIV cultures	BC	-5330	-5230	-5280		*	*	*	*	*	*	4	4	41.19	3.83	*	THDL	U1-U4	relative chronology	197
19	43.10	25.60	Samovodene	Multil.tell-V+VI hor.dwrd-Neolithic	HR	-5420	-5220	-5320	355//17	T	17	5.70	53.40	3.20	119	9	6	43.78	3.42	*	THkD	C'36-C'50//C66-C72	rel.chronology&stratigraphy	197
5	*43.20*	*26.60*	*Ovcharovo*	*Gorata(Ruec)-II hor.upwrd-Neolithic-KII*	*HR*	*-5470*	*-5326*	*-5398*	*//276*	*T*	*24*	*353.50*	*61.12*	*2.26*	*172*	*12*	*8*	*32.93*	*2.64*	*	*THDL*	*R1-R39*	*14C(Bln1544,1620,2030,32)*	*239,502*
294	*43.70*	*25.30*	*Koprivetz*	*II hor.upwrd-end of Early Neolithic*	*HR*	*-5480*	*-5380*	*-5430*	*358//293*	*TA*	*8*	*348.92*	*67.60*	*2.57*	*466*	*5*	*5*	*30.66*	*0.38*	*	*THpT*	*Kp7 - Kp15*	*relative chronology*	*239,502*
355	**43.10**	**25.60**	**Samovodene**	**Multil.tell-VII+VIII hor. dwrd-Neolithic**	**HR**	**-5520**	**-5380**	**-5450**	**354//19**	**T**	**11**	**7.40**	**59.30**	**2.60**	**301**	**6**	**5**	**30.91**	**2.83**	*****	**THDL**	**S38-S46//S51-S54**	**relative chronology**	**239**
326	42.07	25.44	Jabalkovo	I hor.dwrd-the youngest hor.- E.Neolithic	BC	-5520	-5400	-5460		TA	11	3.40	56.00	4.00	130	13	11	34.77	1.08	*	THpT	L20-L49	archaeological	502

6	43.00	27.50	Gol._Delchevo	Multilevel tell-I hor.upwrd - Neolithic	BC	-5520	-5420	-5470	//35	*	*	*	*	*	*	8	7	36.30	5.52	*	THDL	510-518	rel.chronology&stratigraphy	197
262	43.30	26.20	Popovo	The reserve-Neolithic - KII culture	KL	-5530	-5430	-5480		TA	28	353.80	59.90	1.90	192	7	7	39.22	1.01	*	THkD/THpT	R47-R76	relative chronology	502
14	42.10	23.10	Balgarchevo	Neolithic-I hor.upwrd-exhibition hearth	HR	-5520	-5450	-5485		T	6	352.80	55.70	4.50	221	5	5	46.25	2.04	*	THkD	Bl 4 - Bl 9	14C; rel.chronology	197
13	42.60	25.40	Kazanlak	Multil.tell-VIII+IX hor.dwrd-end E.Neolithic	HR	-5530	-5450	-5490	//18	T	11	358.94	54.53	2.50	311	11	10	44.26	4.14	*	THDL	424-443	relative chronology	502
358	**43.70**	**25.30**	**Koprivetz**	**I hor.upwrd-Early Neolithic**	**HR**	**-5550**	**-5450**	**-5500**	**//294**	**TA**	**8**	**4.27**	**64.20**	**2.08**	**707**	**5**	**5**	**34.89**	**0.91**	*****	**THpT**	**Kp16-Kp23**	**relative chronology**	**239**
354	**43.10**	**25.60**	**Samovodene**	**Multil.tell-IX hor. downward-Neolithic**	**HR**	**-5620**	**-5460**	**-5540**	**10//355**	**T**	**11**	**5.20**	**59.70**	**3.50**	**174**	**5**	**4**	**47.00**	**3.65**	*****	**THDL**	**S59-S6//S73-S76**	**relative chronology**	**239**
259	42.50	25.90	Karanovo	Multilevel tell-KII-Early Neolithic	BC	-5600	-5500	-5550		TA	26	359.50	63.30	1.60	292	8	7	52.43	2.32	*	THkD	Kn23-Kn48	relative chronology	197
8	*41.80*	*23.60*	*Dobrinishte*	*Early Neolithic (second half)*	*HR*	*-5625*	*-5490*	*-5558*		*TA*	*12*	*356.80*	*65.50*	*3.10*	*187*	*7*	*7*	*41.41*	*1.49*	*	*THkD*	*Db1-Db19*	*14C(Bln-3785,86)*	*239,502*
10	*43.10*	*25.60*	*Samovodene*	*Multilevel tell-burnt dwell.-Neolitthic*	*HR*	*-5670*	*-5530*	*-5600*	*9//354*	*T*	*12*	*0.80*	*61.40*	*2.60*	*271*	*10*	*10*	*37.17*	*2.54*	*	*THDL*	*S24-S36//S47-S50*	*relative chronology*	*239,502*
9	*43.10*	*25.60*	*Samovodene*	*Multilevel tell-XI hor. dwrd-Neolithic*	*HR*	*-5720*	*-5600*	*-5660*	*//10*	*T*	*16*	*355.00*	*51.80*	*2.70*	*192*	*7*	*5*	*41.43*	*2.59*	*	*THDL*	*S1-S23*	*rel.chronology&stratigraphy*	*239,502*
7	*42.50*	*25.70*	*Stara_Zagora*	*Okruzhna hospital-KII cult.-burnt dwell.*	*BC*	*-5742*	*-5617*	*-5680*		*T*	*30*	*351.90*	*65.17*	*3.10*	*72*	*13*	*13*	*48.63*	*4.12*	*	*THDL*	*Sz1-Sz52*	*14C(Bln-1250,52;1163,64,64A)*	*239,502*
324	*42.30*	*22.67*	*Kustendil*	*Early Neolithic site Piperkov chiflik*	*BC*	*-5800*	*-5600*	*-5700*		*TA*	*15*	*348.20*	*59.30*	*2.00*	*370*	*22*	*19*	*44.04*	*4.96*	*	*THpT*	*Pch1-Pch23*	*Rel.chronology ceramic features*	*371*
11	*42.40*	*23.10*	*Galabnik*	*VIII hor.upwrd-2-2.25m.depth-Neolithic*	*HR*	*-5784*	*-5663*	*-5724*	*249//*	*TA*	*14*	*355.90*	*60.90*	*2.40*	*255*	*16*	*12*	*59.03*	*2.80*	*	*THkD/THpT*	*Gl2-Gl9//Gl21-Gl32*	*14C (Bln-3576,4091,92,93,GrN-19783)*	*239,502*
261	*41.50*	*23.50*	*Kovatchevo*	*Remains of fire-sq.K13-20-KI culture*	*BT*	*-5879*	*-5569*	*-5724*	*247//*	*TA*	*10*	*355.50*	*63.80*	*3.30*	*205*	*6*	*6*	*37.69*	*4.32*	*	*THDL*	*Ko2-Ko14*	*14C(Ly-6553,54)*	*239,502*
4	42.70	23.30	Sofia	Printing house-Neolithic-KI-Starchevo A	BC	-5830	-5630	-5730		*	*	*	*	*	*	3	3	44.88	0.88	*	THDL	Sf1-Sf6	relative chronology	197
241	42.70	23.30	Sofia	Slatina-E.Neolithic house-the fire	BC	-5740	-5730	-5735		T	10	340.70	57.10	4.80	101	11	11	45.27	2.00	*	THkD/THpT	Sln1-Sln21	archaeological	502
2	42.00	24.10	Rakitovo	Makakov bridge - Starchevo I-KI culture	BC	-5790	-5690	-5740		*	*	*	*	*	*	3	3	52.36	3.96	*	THDL	B386-B397	relative chronology	197
139	*42.07*	*25.44*	*Jabalkovo*	*II hor.dwrd-E.Neolithic-site's oldest hor.*	*BC*	*-5850*	*-5650*	*-5750*		*TA*	*21*	*359.50*	*62.40*	*2.50*	*167*	*23*	*22*	*43.39*	*4.03*	*	*THpT*	*L15-L27//L50-L67*	*stratigraphy*	*239,502*
249	*42.40*	*23.10*	*Galabnik*	*VIIhor.upwrd-2.6m.depth-E. Neolithic*	*BC*	*-5834*	*-5674*	*-5754*	*250//11*	*	*	*	*	*	*	*5*	*4*	*63.26*	*0.84*	*	*THkD/THpT*	*Gl33-Gl36*	*(14C) stratigraphy*	*239,502*
242	*42.70*	*23.30*	*Sofia*	*Slatina-baked floor-E.Neolithic house*	*BF*	*-5802*	*-5717*	*-5760*		*TA*	*6*	*345.25*	*59.88*	*4.70*	*204*	*9*	*9*	*62.00*	*1.86*	*	*THkD*	*Sln11-Sln31*	*14C(Bln3434-43;Bln3504,3555)*	*239,502*
243	*41.90*	*23.50*	*Eleshnitza*	*Early Neolithic-KI culture-unoriented*	*BC*	*-5836*	*-5717*	*-5777*		*	*	*	*	*	*	*6*	*5*	*55.42*	*2.08*	*	*THkD/THpT*	*E1-E4*	*14C(Bln-3237-42;Bln-3244,45)*	*239,502*
246	*42.30*	*23.20*	*Krajnitzi*	*Early Neolithic - beginning*	*BC*	*-5870*	*-5710*	*-5790*		*AF*	*4*	*335.53*	*63.63*	*4.80*	*367*	*5*	*5*	*56.53*	*4.52*	*	*THkD/THpT*	*KRN1-KRN4*	*relative chronology*	*239,502*
250	*42.40*	*23.10*	*Galabnik*	*I hor.upwrd-4.5m.depth-E.Neolithic*	*BC*	*-5991*	*-5841*	*-5916*	*//249*	*TA*	*4*	*340.61*	*51.50*	*4.96*	*344*	*7*	*4*	*46.83*	*2.36*	*	*THkD/THpT*	*Gl12-Gl20*	*14C (Bln-3579,79H,80,81,82)*	*239,502*
247	*41.50*	*23.50*	*Kovatchevo*	*Earliest stage of E.Neolithic site-sect.L*	*KL*	*-5999*	*-5896*	*-5948*	*//261*	*TA*	*41*	*350.80*	*64.00*	*1.60*	*183*	*19*	*15*	*53.72*	*2.46*	*	*THpT*	*Ko15-Ko70*	*14C(GrA-44365,581;OxA-20247)*	*172*